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100, 150, 200 and 300 mesh

also both water-based and spirit-based Zircon mould and core washes

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HUNter 6688 (22 lines)

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Don't leave it to chance!

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CUPOBRIX BRIQUETTED ALLOYS

Simple to handle and control, Serfco Briquetted Alloys resist crushing and breaking and eliminate fines, dust and wastage. There's NO WASTE and NO WEIGHING. Serfco Briquetted Alloys provide the foundryman with an extremely economical, simple and accurate method of alloy addition. Convenient to store (inside or out) their refractory binder prevents oxidation loss.

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Each packet of Serfco Packetted Ferro-Alloys has printed instructions on the back—each is differently coloured for different elements. The exact amount of the required element can easily be added with accuracy and speed. Oxidation loss is allowed for and the net weight of alloy in each packet always remains the same.

Made from specially selected alloys, carefully graded and without fines or dust.

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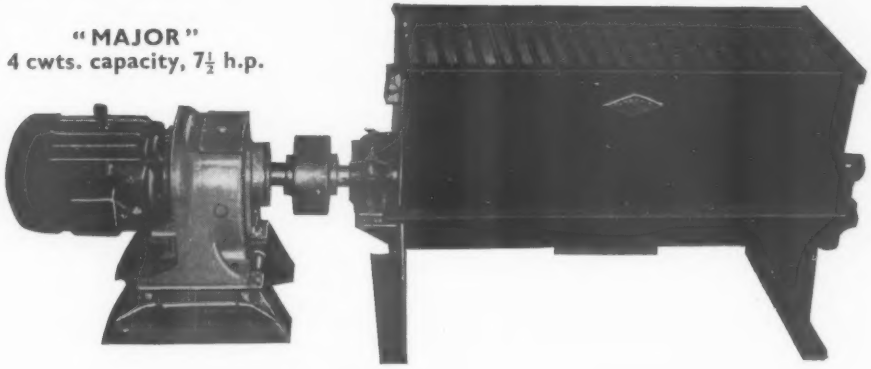
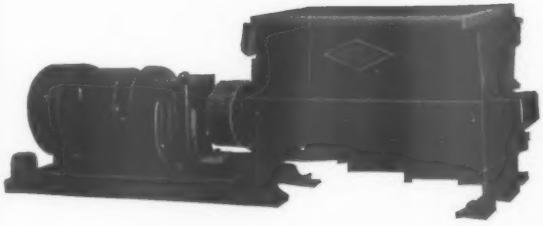
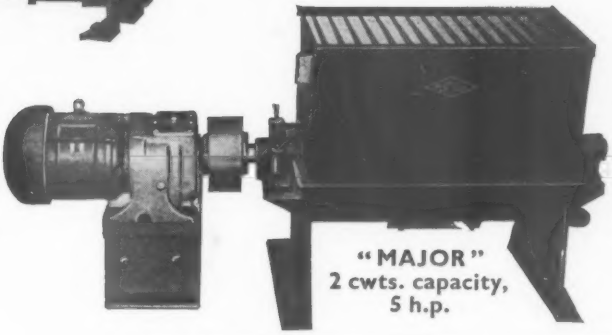
4 cwts. capacity, 7½ h.p.





"MINOR"
50 lbs. capacity, 1 h.p.



"MAJOR"
2 cwts. capacity,
5 h.p.

★ *Rapid intensive mixing.*
★ *Fixed safety locking device.*
★ *Also supplied with belt drive.*
★ *Any voltage supplied.*
★ *Mixing time, 2-4 minutes each batch.*
★ *Low upkeep costs.*

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(REGISTERED TRADE MARK)

Office and Works
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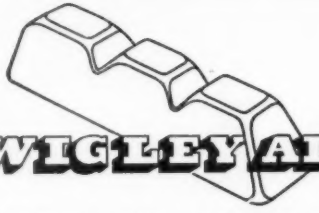
ALUMINIUM ALLOY INGOTS

Make the best Castings

X-ray examination of Gas Turbine Casting made in the foundries of Rolls-Royce Limited, Derby.



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HARDENER ALLOYS — DEOXIDISERS — POWDERS

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REASONABLY PRICED YET WITH ALL THESE ADVANTAGES!

FAST CUTTING
POWER ECONOMY 5 H.P. TOTALLY ENCLOSED MOTOR
DUST FREE (CUTTING WHEEL IS EXTRACTOR FAN)
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SMALL FLOOR SPACE

It's another BRAMCUT success . . .

After a lot of research and experiment, it's here—the new Bramcut Foundry Cutting Off Machine. It cuts, at high speed, the gates and risers on non-ferrous castings. It offers the maximum of efficiency—economy of power—safety—and very effective dust extraction.

These are some of the points which indicate why the new Bramcut is so advanced, and why it is sure of a big welcome.

Tangent point between cutting wheel and casting provides maximum utilisation of horse power. Result: extremely fast, economic cutting and long wheel life.

Helmet wheel guard, yielding great safety, can be turned on a quadrant for various shapes of casting.

Beneath the table, the cutting wheel is enclosed by an involute dust-conveying duct; the air draught created by the cutting wheel is itself used to carry off the swarf to a convenient collector. This is wonderfully efficient. No dust extraction necessary.

Use of a flat plastic-nylon belt at proper tension assists power economy.

16in. Crownflex Wheels of laminated plastic, highly resistant to breakage, to cut any material, are used.

Two speeds give reasonably uniform peripheral speed.

For price and further details, please contact:

GRINDING IMPROVEMENTS (EDINBURGH) LIMITED
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AUTOMATIC CHARGING CYCLE "One-man" control

CRANE operator controls the making up of Metallics Charge in Weigh Hopper, he also controls the sequence of delivering the complete charge via Drop Bottom Bucket Charger into Cupolas. Each furnace has a 17-ton per hour capacity. The automatic cycle of operations, including Coke and Stone feed to Weigh Hopper with recording of charge weights, are all under one-man push-button control in Crane Cab.

A new concept in
MODERN FOUNDRY ECONOMICS

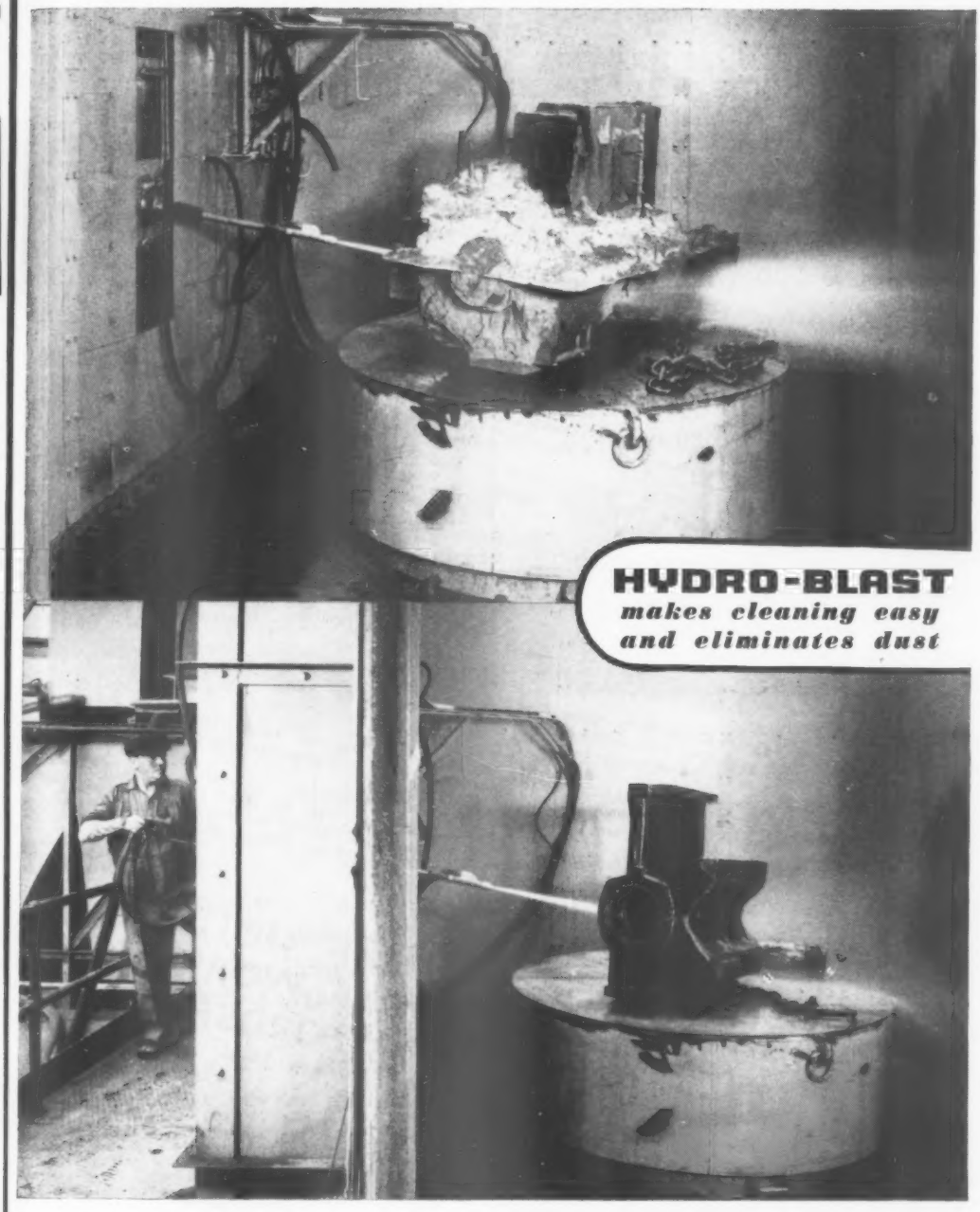
Our installations can also incorporate other modern features such as Slag Granulation, Wet Arresters, Water Cooled Melting Zones, etc., etc.

Illustration (reproduced by courtesy of Messrs. BILSTON FOUNDRIES Ltd.) is similar to the one described above.

E. A. ROPER & CO. LTD. ***Foundry Equipment Engineers***

Telephone: Keighley 4215/6 **KEIGHLEY · YORKSHIRE** Telegrams: "Climax" Keighley

I.J.P.



Built in England by

PNEULEC LIMITED, SMETHWICK, Nr. BIRMINGHAM

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"B.B.R."

BRADLEYS BASIC REFINED Pig Iron

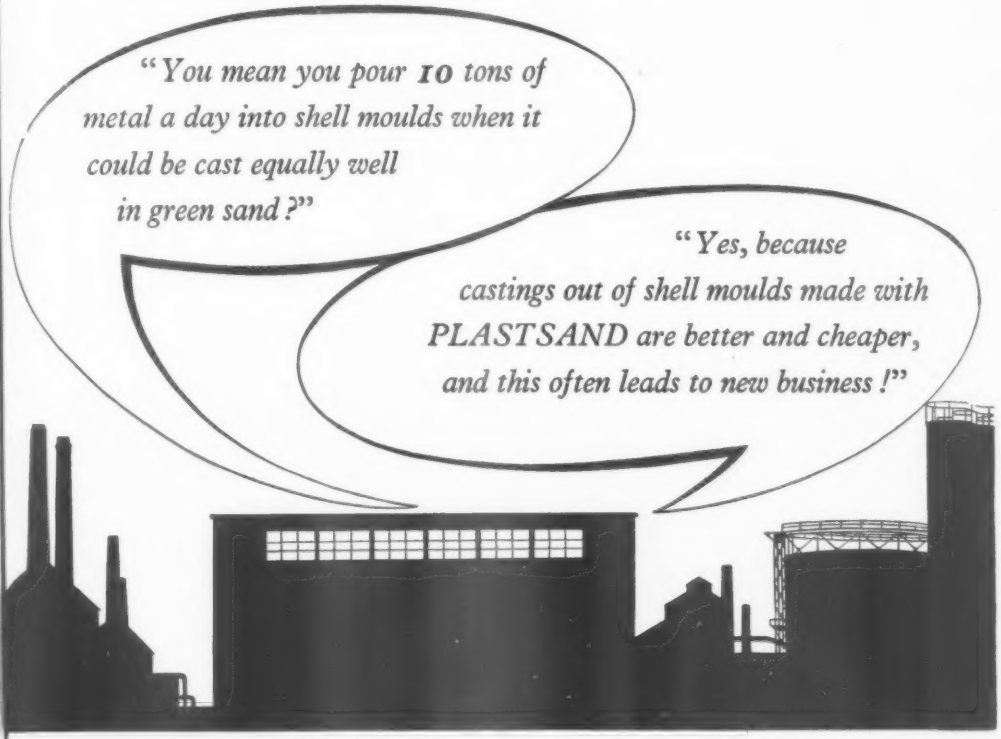
BRADLEYS BASIC REFINED is produced by a newly developed process utilising basic lined furnaces and operating with a wholly basic slag.

BASIC REFINED IRON is specially suitable for Nodular or Spheroidal Graphite Iron, Roll Making, Steel Making, Carburising Iron and all processes requiring an exceptionally pure cast iron.

- TOTAL CARBONS in "B.B.R." are normally available from 3·2% to 4·0%. In certain cases specifications for Carbons in excess of 4·0% can be met. In all cases Total Carbon contents are determined by the Volumetric combustion method utilising solid or chilled samples.
- SULPHUR contents in "B.B.R." normally range between 0·004% and 0·02%. Specially low sulphurs determined within the limits of accuracy of B.S.I. Method (Specification No. 1121, Part I, 1943) can be guaranteed.
- PHOSPHORUS contents of "B.B.R." normally range from 0·04% to 0·50% according to requirements. Specifications of less than 0·04% can be met under certain circumstances.
- SILICON and MANGANESE contents are supplied to specification. Silicons normally range from 0·20% to 3·0% and Manganese from 0·30% to 1·5%.
- RESIDUAL ELEMENTS. Control is exercised over the whole range of residual metallic elements through our Spectrographic Laboratories and Certificates of Analysis can be supplied with every consignment.

BRADLEY & FOSTER LIMITED
DARLASTON IRON WORKS
DARLASTON · STAFFORDSHIRE

A member of the Staveley Coal & Iron Co., Ltd., Group.


"You mean you pour 10 tons of metal a day into shell moulds when it could be cast equally well in green sand?"
"Yes, because castings out of shell moulds made with PLASTSAND are better and cheaper, and this often leads to new business!"

For your shell mould and shell core production you may choose:

Either: to draw supplies of PLASTSAND from the Fordath plant at West Bromwich. 24 hours notice will ensure despatch.

Or: to install Fordath coating equipment for use with Fordath liquid phenolics and produce your own requirements of PLASTSAND.

PLASTSAND, the resin coated sand with the built-in release agent was what made shell moulding really work. It is in daily use in the majority of shell shops in Britain. And large tonnages leave Fordath regularly for the Continent.

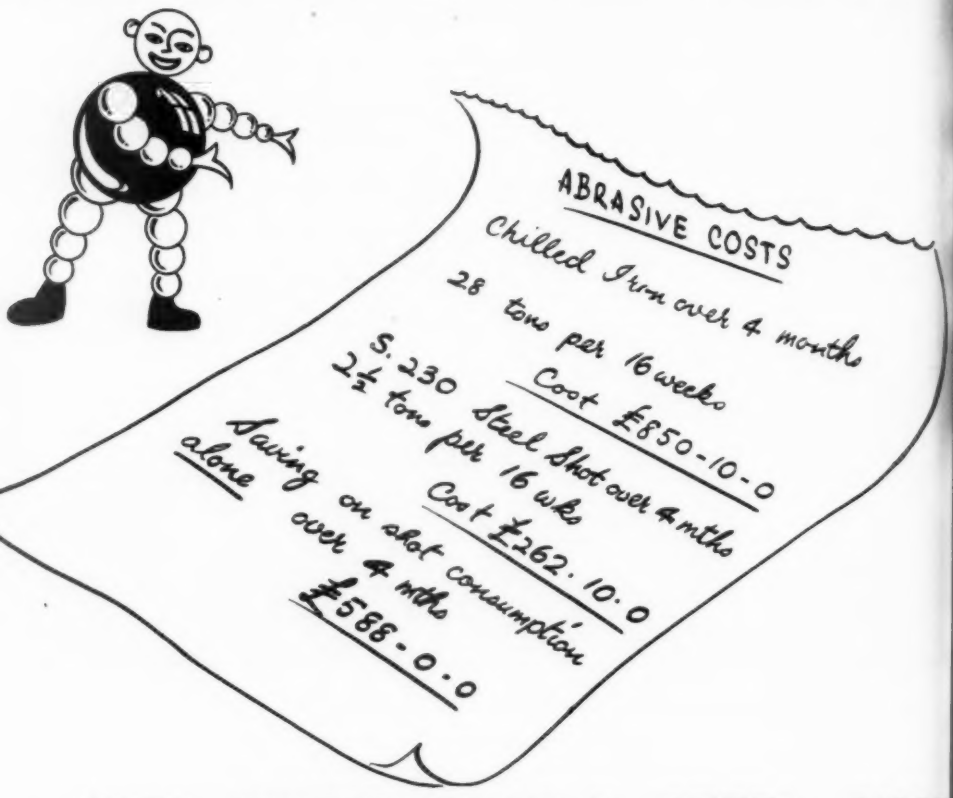
FORDATH SHELL-SAND COATING EQUIPMENT, is available for foundries who choose to coat their own sand. Fordath equipment is now operating or under installation in U.S.A., France, Germany, Italy, Yugoslavia, Sweden as well as here in the U.K.

FORDATH PHENOLIC COATING RESINS — 726, 728, 530—are the basis of the unique characteristics of PLASTSAND. When you install coating equipment you will ask for these resins, made by Fordath at West Bromwich.

Ask **FORDATH** *now about their SHELL PROCESS PRODUCTS*

THE FORDATH ENGINEERING CO. LTD., BRANDON WAY, WEST BROMWICH, STAFFS.
Telephone: WESt Bromwich 1665 (4 lines) Telegrams: Metallical, West Bromwich.

SAVINGS LIKE THIS CAN BE YOURS . . .


ABRASIVE COSTS
Chilled Iron over 4 months
28 tons per 16 weeks
Cost £850-10-0
S.230 Steel Shot over 4 mths
2½ tons per 16 wks
Cost £262.10.0
Saving on shot consumption alone over 4 mths
£588-0-0

. . . WITH WHEELABRATOR STEEL SHOT

These costs are actual figures obtained on normal production runs over a period of sixteen weeks, by a well-known Company in the north-east of England.

Have you yet Investigated the potential savings on blast cleaning costs which can be made in YOUR factory?
Write for full details today.

TILGHMAN'S LIMITED
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BROADHEATH • ALTRINCHAM • CHESHIRE

A member of the Staveley Coal & Iron Co. Ltd. Group

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SCOTLAND: Balbardie Ltd., 227 Bath Street, Glasgow, C.2.
110, Hanover Street, Edinburgh, 2.
NORTHERN IRELAND: Stewart Industrial Services Ltd., 129, Ormeau Road, Belfast.
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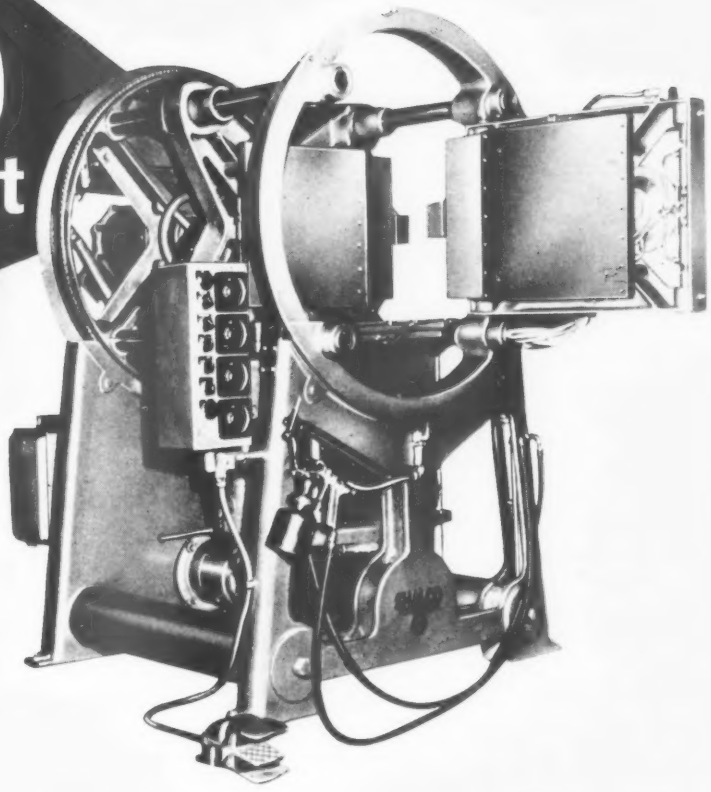
The U180

SHELL CORE BLOWER

Another SHALCO achievement



BETTER CORES IN LESS TIME.

SIMPLE OPERATION.

LOWER COST PER CORE.

CLEANER CASTINGS.

OTHER SHALCO MODELS:
M.C.M.5 Semi-Automatic in 5 sizes: M.C.3 Manual.

C

BRITISH BUILT | UNDER LICENCE BY

AUTOMATICALLY CONTROLLED CYCLE

The operator merely places the core box in position and presses the foot pedal. The U180 does the rest. Investing, blowing, rocking and curing cycles are controlled by adjustable timers. The U180 is complete in itself—separate driers and ovens are eliminated.

THE COLEMAN-WALLWORK
FOUNDRY EQUIPMENT DIVISION

OF STONE-WALLWORK LIMITED

32 VICTORIA STREET, LONDON, S.W.1. *Tel: ABBEY 7681*

WILLIAM
CUMING
& COMPANY LTD.

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Here's a NEW Blacking

– and it's a

WINNER!

No 47

No 47 is not 'just another Blacking'! It is an entirely new type of Blacking and has been fully approved by some of the largest Foundries in the Country. Foundries making really large moulds in Loam or Dry Sand will find it an exceptional blackwash in every way —no limit to weight and *no* section too thick to produce a perfect strip.
It is adequately bonded and has good penetration.

- the ACE of BLACKINGS - a FREE sample on request.

HEAD OFFICE:
KELVINVALE MILLS · MARYHILL · GLASGOW · N.W.
Telephone: MARyhill 1033/4

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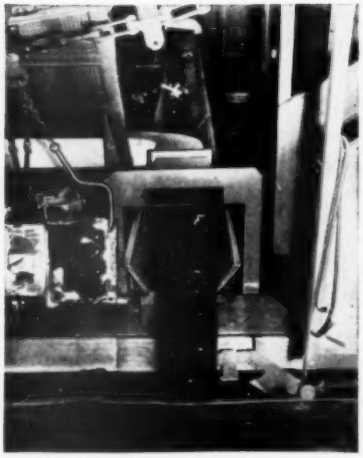
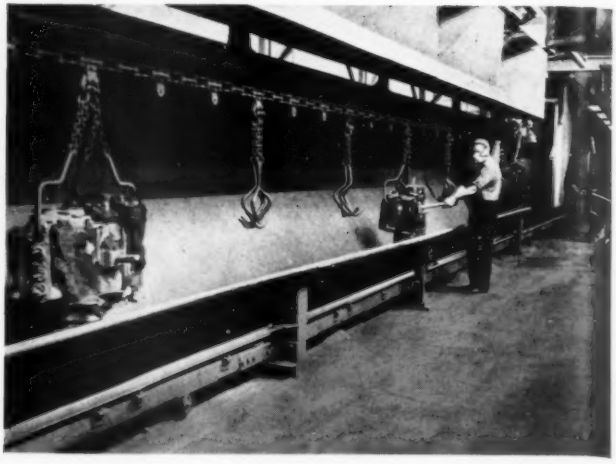
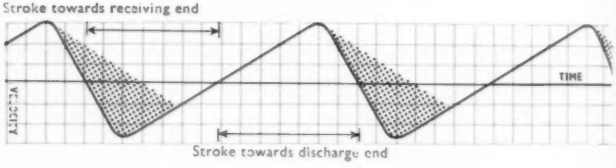


Shaker conveyor discharging scrap on to a similar conveyor. (The photographs reproduced in this advertisement are published by courtesy of Ford Motor Company Limited.)



Sand cores and risers from engine component castings fall on to a shaker conveyor which carries them to a rotary scrap breaker and sand separator.

Shaker conveyor showing type G 20 drive, driven by a 20 h.p. flywheel motor; this robust drive delivers high peaks of energy.



SHAKER CONVEYING

in a mechanised foundry

The Distington-Goodman shaker conveyor is not a jigger conveyor. Its troughs move in only one plane on ball-bearing rollers and propel material by variations in their rates of acceleration and deceleration (these are shown in the time-velocity curve above: the shaded areas represent the movement of material independent from the movement of the troughs).

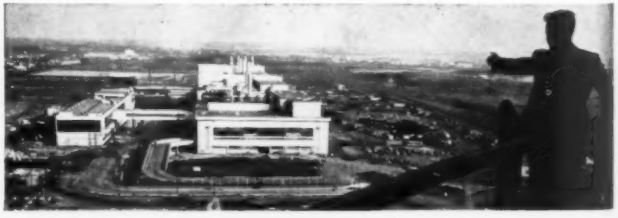
Distington-Goodman shaker conveyors have been used for many years for loading and conveying coal and rock. Their robust all-steel construction makes them ideal for handling hot materials in foundries and cement clinker and sinter.

They are easily extended and contracted and can be made self-loading from stock heaps. Lines of troughing can be made to deviate through angles up to 90°. Conveying capacity depends upon several factors but would normally exceed 60 t.p.h. on the level.

DISTINGTON ENGINEERING COMPANY LIMITED

WORKINGTON · CUMBERLAND · ENGLAND

DISTINGTON



D.J.2

RISEREX and RISERITE

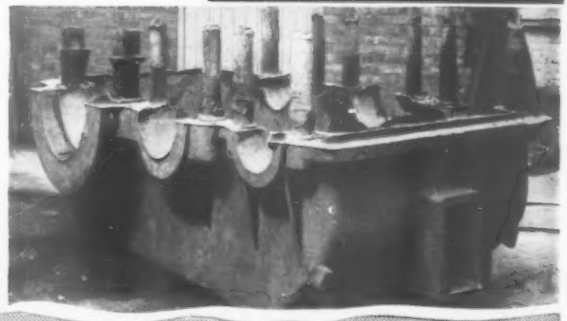
Exothermic Feeding Compounds

RISEREX is a mouldable exothermic compound for the production of feeding sleeves and mould inserts, providing additional local heat and promoting casting soundness. Applied as a riser sleeve it also ensures economy resulting from a higher casting yield.

Exothermic feeding of a Half Gear Casing 4½ tons as cast.

- The mould in the floor before coring up.
- Some of the 12 exothermic sleeves in action.
- The casting showing the 12 exothermic sleeved risers, the use of which produced a high grade sound casting. Made by THE DUDLEY FOUNDRY LTD. and illustrated by their kind permission.

RISERITE hot topping compound provides additional heat and forms an insulating cover or blanket which prevents heat dissipation.



HARMARK
FOUNDRY SUPPLIES

Manufactured by

HARBOROUGH CONSTRUCTION CO·LTD·MARKET HARBOROUGH

The mixture as before

The production of a good casting is the foundryman's first aim. 'A.W.' help by ensuring that his raw material is 'As Before' and an Analysis Certificate accompanies each and every consignment. Nothing is left to chance for this factual laboratory report shows the exact composition of all material in the delivery.

This enables the Ironfounder to obtain consistent results and overcome what is undoubtedly one of the biggest production problems facing the industry today.

WE KNOW — WE MAKE CASTINGS

REFINED PIG IRON

Armstrong Whitworth (Metal Industries) Ltd.
Close Works, Gateshead upon Tyne 8
Telephone: Gateshead 71261

Subsidiary Company:
Jarrow Metal Industries Ltd.
Western Road, Jarrow, Co. Durham

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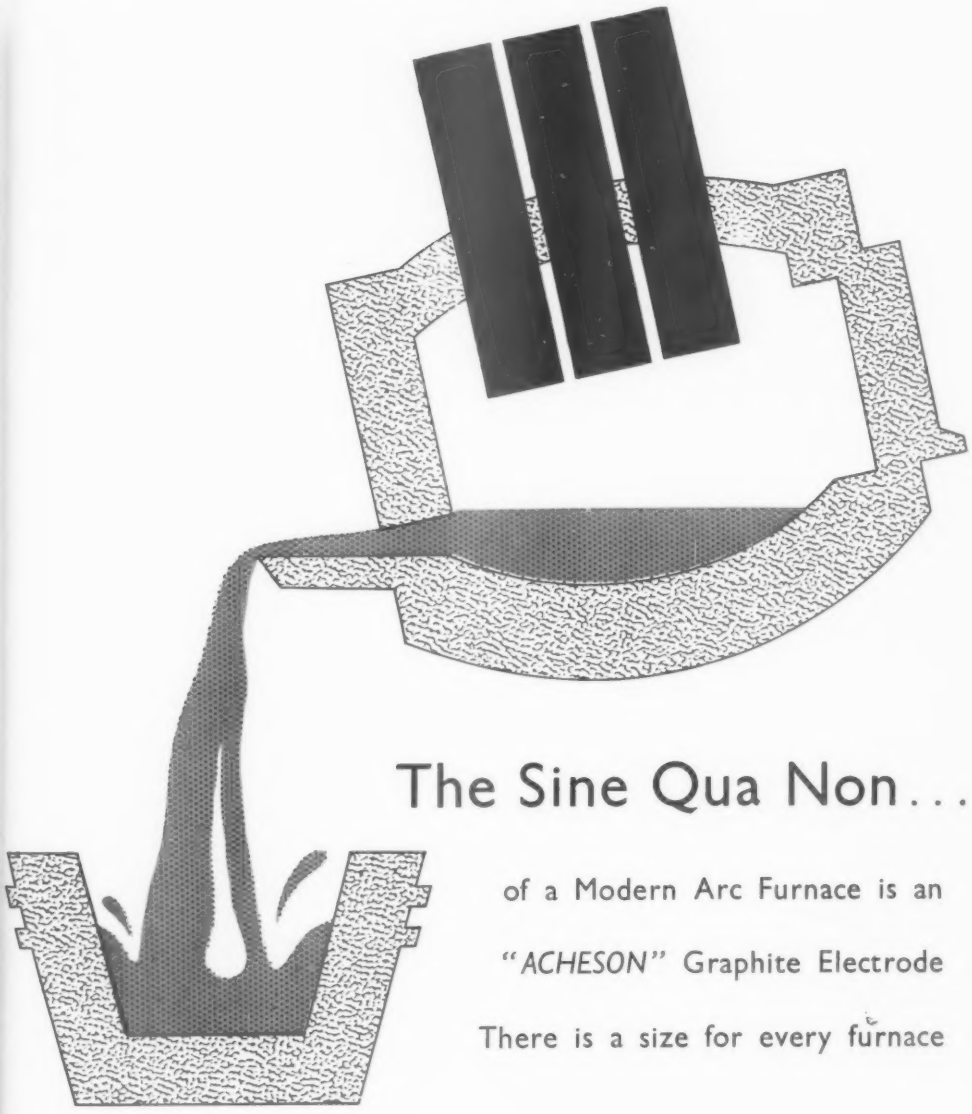


The Sine Qua Non...

of a Modern Arc Furnace is an

"ACHESON" Graphite Electrode

There is a size for every furnace

ACHESON

TRADE MARK

GRAPHITE ELECTRODES

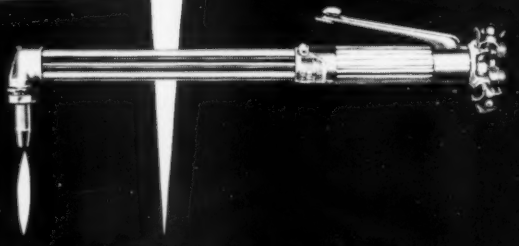
The term ACHESON is a registered trade mark.

BRITISH ACHESON ELECTRODES LIMITED · WINCOBANK · SHEFFIELD · PHONE: ROTHERHAM 4836

FROM BRITISH OXYGEN—

FOR BRITISH INDUSTRY

British Oxygen is constantly developing better tools for Industry. Whatever your cutting needs, we have a blowpipe or machine ready to do the job quickly and at low cost. Ask any of our 38 branch offices for experienced and expert advice.



British Oxygen Gases Limited

INDUSTRIAL DIVISION · SPENCER HOUSE · 27 ST. JAMES'S PLACE · LONDON S.W.1

A BOC Company

cores

cores

blown
hand-rammed
extruded
sand-slung
jolted

The binder for them all is THOR SB-109. A versatile binder, indeed; and what is more, this Phenol/Formaldehyde resin is also extremely tolerant of sand condition. Thus it is the answer to the problem of finding a binder which can be used with hot sand (and also wet sand) and still give excellent performance.

Note, too, these other advantages of THOR SB-109:

- It can be used in the hot core-box technique to produce dimensionally stable cores, ready for use, in 2 minutes.
- Suitably diluted, it can be used as a mould or core spray to give superior casting finish.
- It can be used in sand mixes made in any normal foundry mixer and, suitably adjusted, will perform satisfactorily under the most exacting foundry conditions.

Other Core Binders in the THOR range include:

THOR SB-14: A high performance, special purpose U/F resin binder.

THOR M-1288: A complete binder imparting both green and dry strength.

THOR M-1326: An air-setting resinous binder of high performance.

THOR
FOUNDRY RESINS

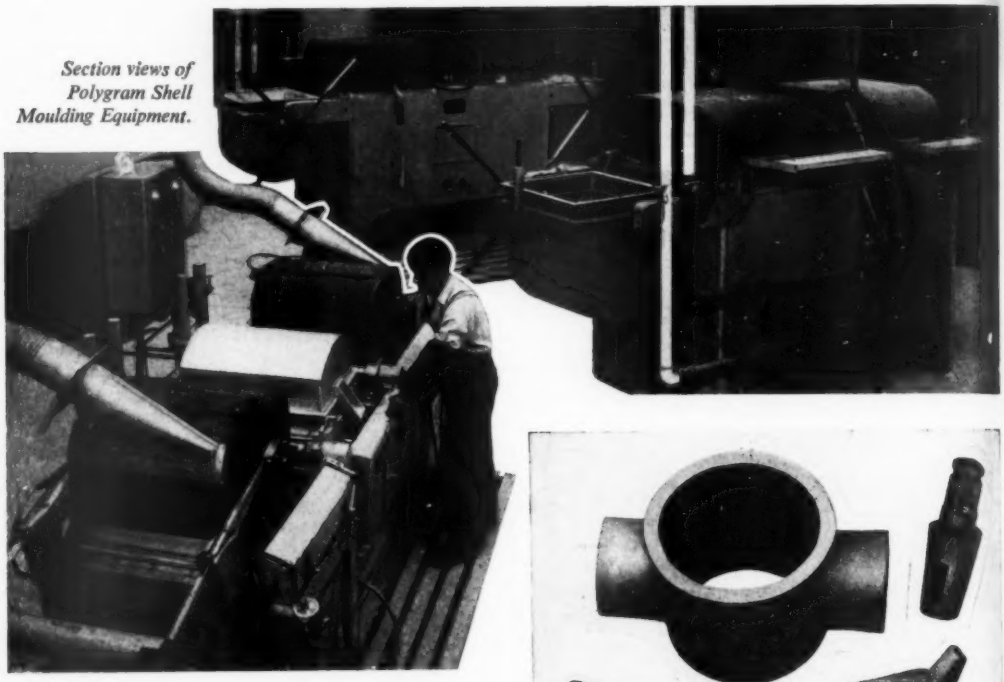
T26

Why not write to us for full details?

LEICESTER, LOVELL & CO. LTD.,
North Baddesley, Southampton
Tel: Rownhams 363 (6 lines)

Polygram.. in the new Steel foundry of Samuel Osborn & Co., Limited

Section views of Polygram Shell Moulding Equipment.



Samuel Osborn & Co., Limited, achieve greater accuracy, soundness and improved surface finish by Shell Moulding a wide variety of castings in Stainless, Acid and Heat Resisting Steels, as well as other High Alloy, Tool, Die and Low Carbon Steels.

A varied range of Shell Moulded Steel Production castings.
Photograph by courtesy of Samuel Osborn & Co., Limited, Sheffield.

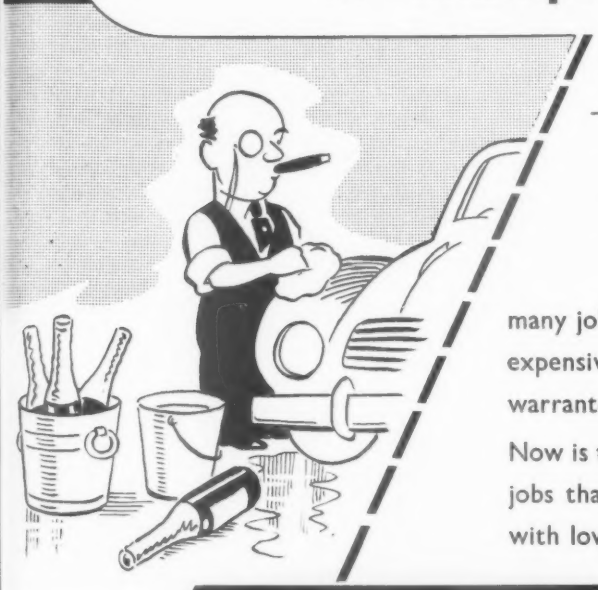
Polygram Casting Company have a competent and complete service to offer and your enquiries are invited.

Polygram

FIRST NAME IN SHELL MOULDING

Polygram Casting Company Limited, Shernfold Park, Frant, Tunbridge Wells, Kent. Telephone Frant 346 (5 lines)

You wouldn't wash your car in Champagne!



—Similarly in foundry practice : here's a new Core Oil designed and priced to promote economies in those many jobs where the use of more expensive materials is not truly warranted.

Now is the time to sort out those jobs that can be done effectively with lower production costs.

"Baltiseed" 360 CORE OIL

CUT OUT FANCY SPENDING — IF THIS OIL WILL DO *THAT* JOB—IT'S SOUND ECONOMY!

Send for descriptive literature NOW. Large working samples freely available, backed up by personal technical service.

Wm. ASKE & Co. Ltd.

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Telephone: Halifax 60661/2 Telegrams: Baltiseed, Halifax.

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The large economy size

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Replica of master pattern, 6 ft long, for a diagonal brace of a Caterpillar D8 Tractor. Cast in Araldite by Wilkinson & Co. Ltd, Bilston, for F. H. Lloyd & Co. Ltd, Wednesbury, suppliers of castings to Caterpillar Tractor Co. Ltd, Glasgow.

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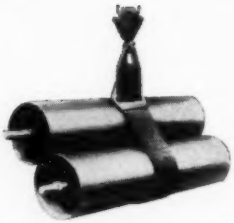

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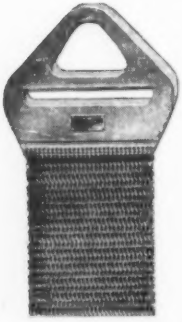

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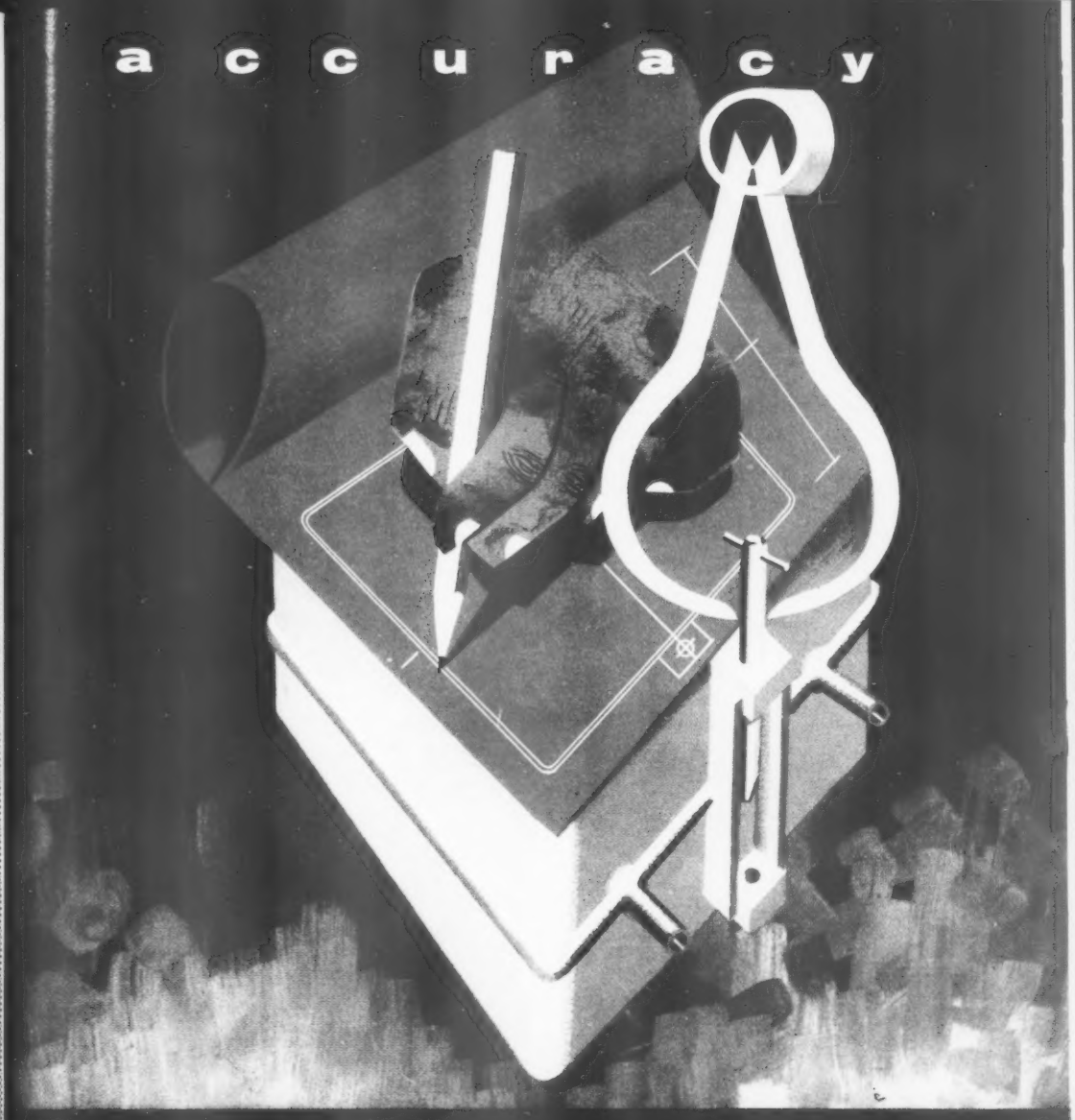

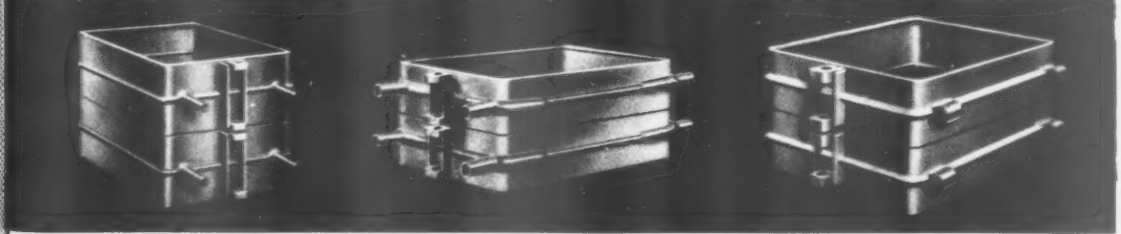

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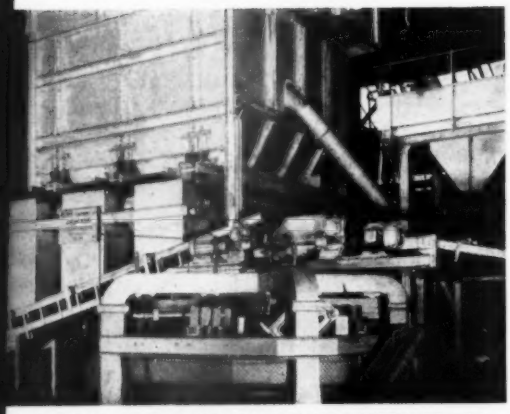

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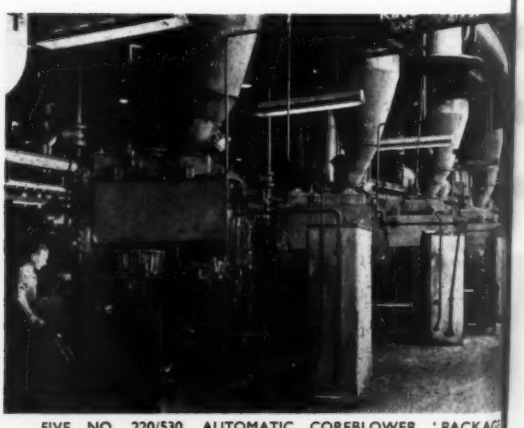

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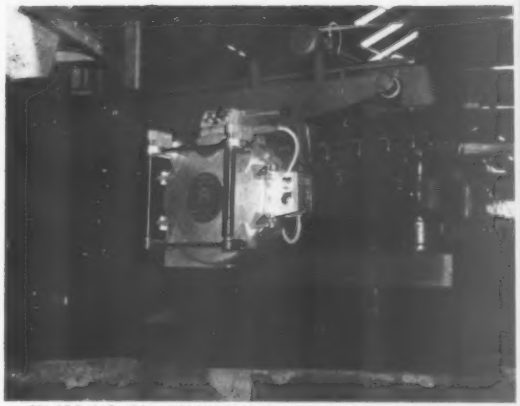

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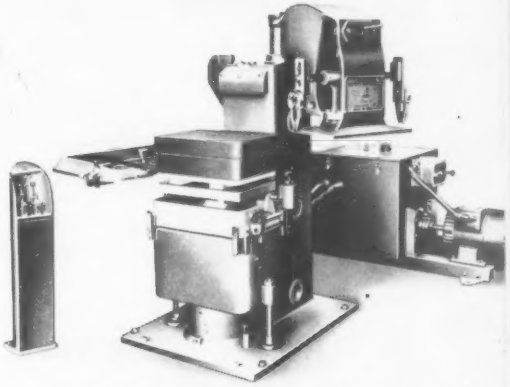

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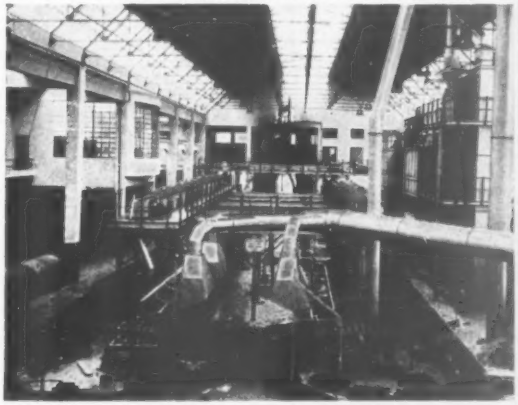

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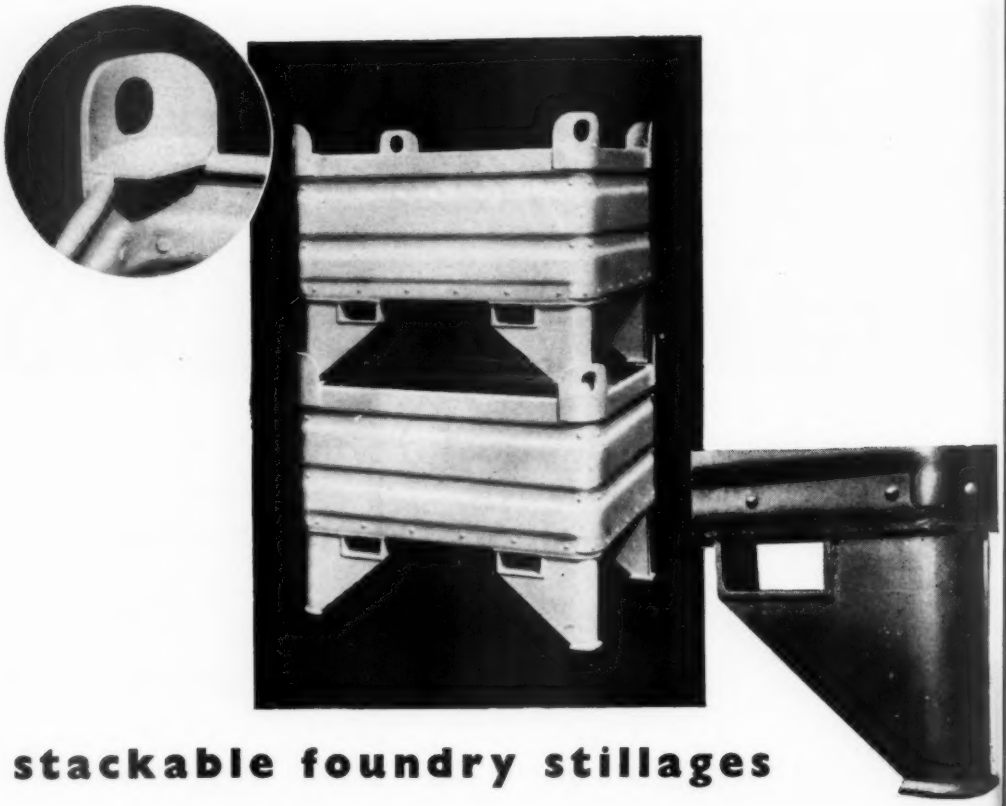

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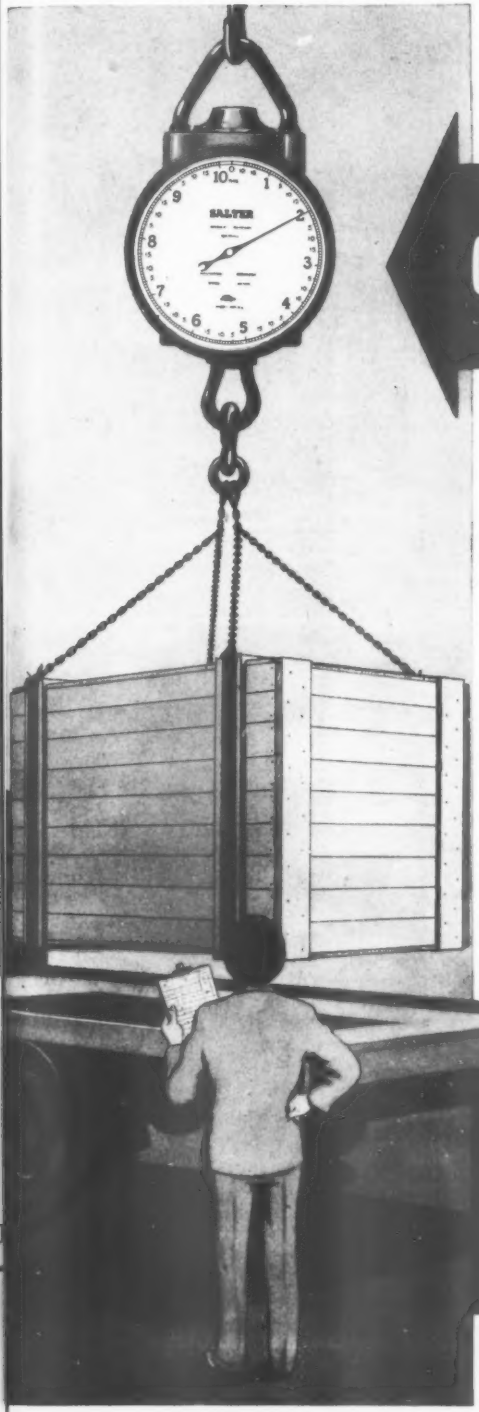

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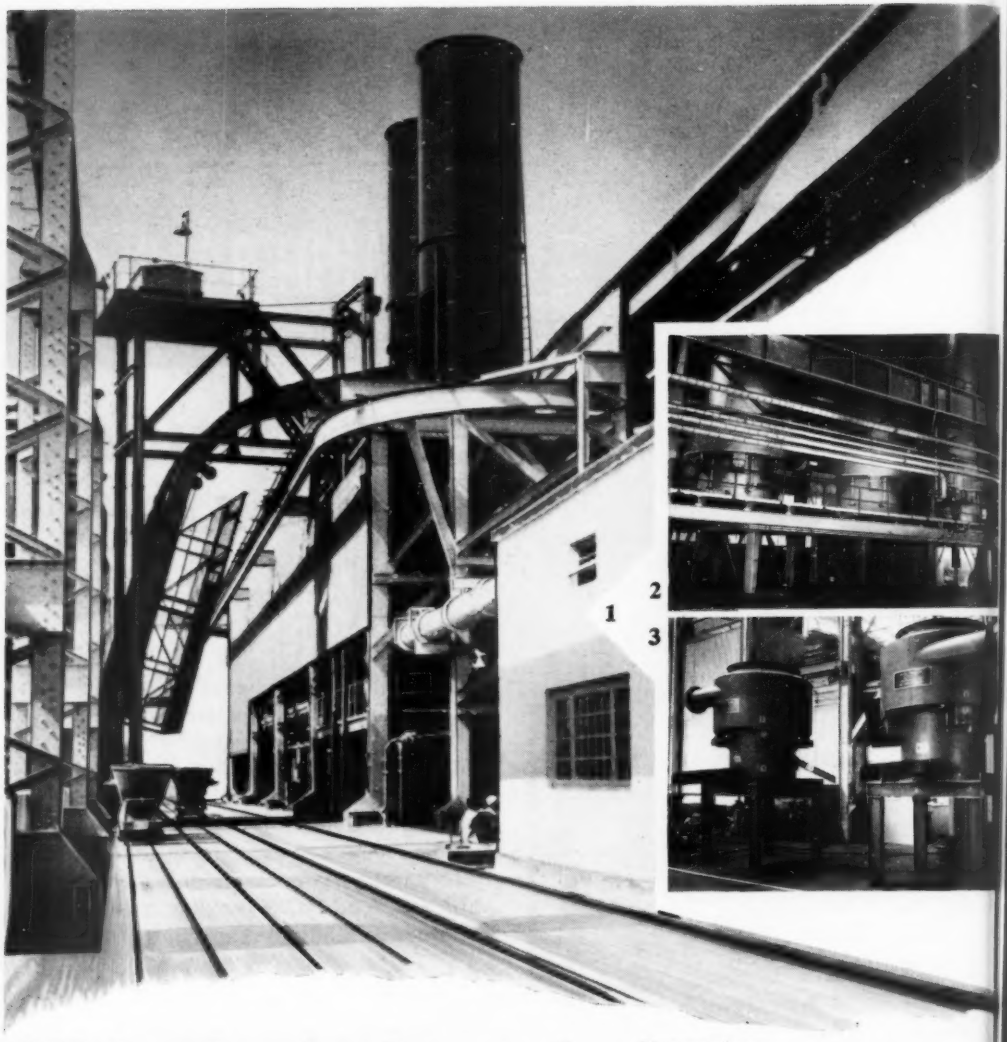

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(1) Two 20-ton-per-hour cupolas with swi charger bridging a rail track. (Indi Iron & Steel Co. Ltd.)

(2) Three 35-ton-per-hour cupolas wi automatic air weight control and w dust arresters. (Guest Keen Iron & Steel Co. Ltd.)

(3) Bottom sections of two 4-ton-per-h cupolas in the works.

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For green and dry sand practice based on natural sands where the moisture content varies.
Where milling time is short and intensive mixing cannot be given.
To reduce the danger of cracked castings, especially in malleable iron.
To increase the green strength of organically bonded core sands.

FULBOND 2

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Practice Recommendations

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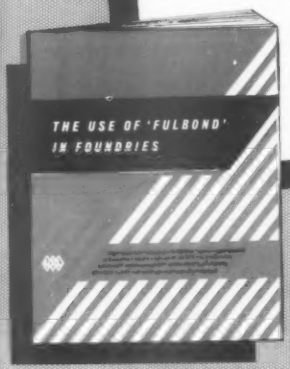
For increasing the green strength of sodium silicate sands and adjusting the breakdown properties.
For boosting the green strength of both organic and inorganic sands.



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ORGANIZATION OF THE UK FOUNDRY INDUSTRY

The foundry industry of the United Kingdom is represented by the following organizations, many of whose proceedings are regularly reported in this JOURNAL :—

Ironfounding Employers' Associations

COUNCIL OF IRONFOUNDRY ASSOCIATIONS

Chairman: **M. J. Glenny**, Dover Engineering Works, Limited, Talbot House, Arundel St., London, W.C.2. *Director:* **K. Marshall.** *Ass. Director:* **J. W. Butler,** *Secretary:* **D. L. Farrant,** 14, Pall Mall, London, S.W.1. Phone: WHitehall 7171. *Participating Associations:* British Cast Iron Research Association (affiliated); Institute of British Foundrymen (affiliated), and the following:—**Association of Automobile and Allied High-duty Ironfounders.** Secretaries, Heathcote and Coleman, 69, Harborne Road, Edgbaston, Birmingham, 15. 'Phone: Edgbaston 4141. Grams: " Clarify," Birmingham, 15. **British Ironfounders' Association and British Bath Manufacturers' Association.** Director and Secretary: J. Galbraith Sneddon, C.A., 145, St. Vincent Street, Glasgow, C.2. 'Phone: Central 2891. 'Grams: " Groundwork," Glasgow. **British Grit Association** (affiliated).—Secretary: J. Campbell MacGregor, 10, Bank Street, Airdrie, Lanarkshire. **British Malleable Tube Fittings Association.**—Secretary: F. B. Ridgwell, 196, Shaftesbury Avenue, London, W.C.2. 'Phone: TEMple Bar 6052-3. 'Grams: " Brimatufia," London. **Cast-Iron Chair Association.**—Secretaries: Peat, Marwick, Mitchell & Co., The Cast Iron Chair Association, Queen's Square, Middlesbrough, Yorkshire. **Cast Iron Axlebox Association and National Ingot Mould Association.**—Secretaries: Peat, Marwick, Mitchell & Company, 301, Glossop Road, Sheffield. 'Phone and 'Grams: Broomhill 63031. **Cast Iron Heating Boiler and Radiator Manufacturers' Association.**—Secretary: Stanley Henderson, 69, Cannon Street, London, E.C.4. 'Phone: CITy 4444. **British Cast Iron Pressure Pipe Association.**—Secretary: W. I. Campbell, 14, Pall Mall, London, S.W.1. Phone: WHitehall 7941. **Cast Iron Segment Association.**—Secretary: W. Rose, Stanton Ironworks Company, Limited, P.O. Box 3, near Nottingham. **Greensand Pipe Founders' Association.**—Secretaries: McClure Naismith Brodie & Company, 77, St. Vincent Street, Glasgow, C.2. 'Phone: Glasgow 9476. 'Grams: "Lycidasm," Glasgow. **National Association of Malleable Ironfounders.**—Secretary: Miss L. Verity, M.B.E., Chamber of Commerce Offices, Tudor House, Bridge Street, Walsall. 'Phone: Walsall 5671. **National and Midland Ironfounders' Association.**—Secretary: F. W. Sims, 69, Harborne Road, Edgbaston, Birmingham. 15. **Roll Makers Association of Great Britain.**—Secretaries: Peat, Marwick, Mitchell & Company, Beaufort House, Newhall Street, Birmingham, 3. 'Phone: Central 6661-3.

NATIONAL FEDERATION OF ENGINEERING & GENERAL IRONFOUNDERS

Chairman: **R. Laroux Handley,** Ferranti Limited, Hollinwood, Lancs. *Secretaries:* **Mann, Judd & Co.,** 8, Fredericks Place, London, E.C.2. **Constituent Associations:** Ironfounders' National Confederation and National Ironfounding Employers' Federation.

IRONFOUNDERS' NATIONAL CONFEDERATION

Chairman: **F. D. Drake,** Drakes (Engineers), Limited, Ovenden, Halifax. Secretaries: **H. Overton, Salt & Company,** 12th Floor, City Centre House, 30, Union Street, Birmingham, 2. 'Phone: Midland 8427. **Branch Associations:** *East and West Ridings.*—Secretary: C. L. Carver, Ellerby Foundry, Ltd., Ellerby Lane, Leeds, 9. *London, Home and Eastern Counties.*—Secretaries: H. Overton, Salt & Company, 30, Union Street, Birmingham, 2. *Midlands.*—Secretary: V. L. Nicholls, Grazebrook Foundry Limited, Blower's Green, nr. Dudley, Worcs. 'Phone: Dudley 2431. *North Midlands:*—Secretary: C. W. Hicks, Rolls-Royce, Limited, Nightingale Road, Derby. *North Western.*—Secretary: P. E. F. Crewdson, Gilbert, Gilkes & Gordon, Ltd., Canal Ironworks, Kendal, Westmorland. 'Phone: Kendal 28.

NATIONAL IRONFOUNDING EMPLOYERS' FEDERATION

President: **R. Laroux Handley,** Ferranti Limited, Hollinwood, Lancs. *Secretaries:* **Mann, Judd & Co.,** 8, Fredericks Place, Old Jewry, London, E.C.2. 'Phone: METropolitan 8613. 'Grams: "Manjudca Phone," London. **Branch Associations :** *Leeds and District Ironfounders' Association.*—Secretary, F. H. Foster, H. J. Gill & Co. (Leeds), Ltd., 194, Cardigan Road, Leeds, 6. 'Phone : 52020. *Leicester and District Ironfounders' Employers' Association.*—Secretary: C. S. Bishop, 8, New Street, Leicester. 'Phone: Leicester 58842. *Liverpool and District Ironfounders' Association.*—Secretary: J. S. Hassal, 16/18, Hackins Hey, Liverpool, 2. 'Phone: Central 10114. *Manchester and District Ironfounders' Employers' Association.*—Secretaries: Webb, Hanson, Bullivant & Co., 90, Deansgate Manchester. 'Phone: Blackfriars 8367. 'Grams: " Sound," Manchester. *Monmouthshire Founders' Association (incorporating Cardiff and District Founders' Association).*—Secretary: I. J. Smith, Tredegar Foundry, Newport, Mon. 'Phone: Newport 66771. 'Grams: " Rogerwinch," Newport. *North of England Ironfounders' Association.*—Secretaries: Mann, Judd, Gordon & Co., 61, Westgate Road, Newcastle-upon-Tyne. 'Phone: Newcastle 20836. Grams: " Mannca," Newcastle. *North Staffordshire Ironfounders' Association.*—Secretary: J. H. L. Beech, Bourner, Bullock & Co., Federation House, Station Road, Stoke-on-Trent. 'Phone: Stoke-on-Trent 44245. *Scottish Ironfounders' Association.*—Secretaries: Mann, Judd, Gordon & Co., 142, St. Vincent Street, Glasgow, C.2. 'Phone: Central 2857. 'Grams: "Mannca," Glasgow. *Sheffield and District Ironfounders' Association.*—Secretary: Frank Hepworth, 59, Clarkehouse Road, Sheffield, 10. Phone: Sheffield 60047. 'Grams: " Emplofedra," Sheffield. *South of England Ironfounders' Association.*—Secretaries : Mann, Judd & Co., 8, Fredericks Place, Old Jewry, London, E.C.2. 'Phone: METropolitan 8613. 'Grams: " Manjudca Phone," London. *Welsh Engineers' and Founders' Association.*—Secretary: W. D. M. Davis, 1, St. James Gardens, Swansea. 'Phone: Swansea 59166. 'Grams: " Iron" Swansea. *West of England Ironfounders' Association.*—Secretaries: Mann, Judd & Co., 8, Fredericks Place, Old Jewry, London, E.C.2. 'Phone: METropolitan 8613. 'Grams: " Manjudca Phone," London. *West Riding Ironfounders' Association.*—Secretaries: C. D. Buckle and Co. (Mr. S. G. Farley), 13, Cheapside, Bradford. 'Phone: Bradford 25346.

Other Employers' Associations:

BRITISH STEEL FOUNDERS' ASSOCIATION

Chairman: **Dr. C. J. Dadswell,** B.Sc., M.I.Mech.E., English Steel Castings Corporation, Limited, River Don Works, Sheffield. *Director and Secretary:* **Robert Barber,** A.C.I.S., Broomgrove Lodge, 13, Broomgrove Road, Sheffield, 10. 'Phone and 'Grams: Sheffield 63046.

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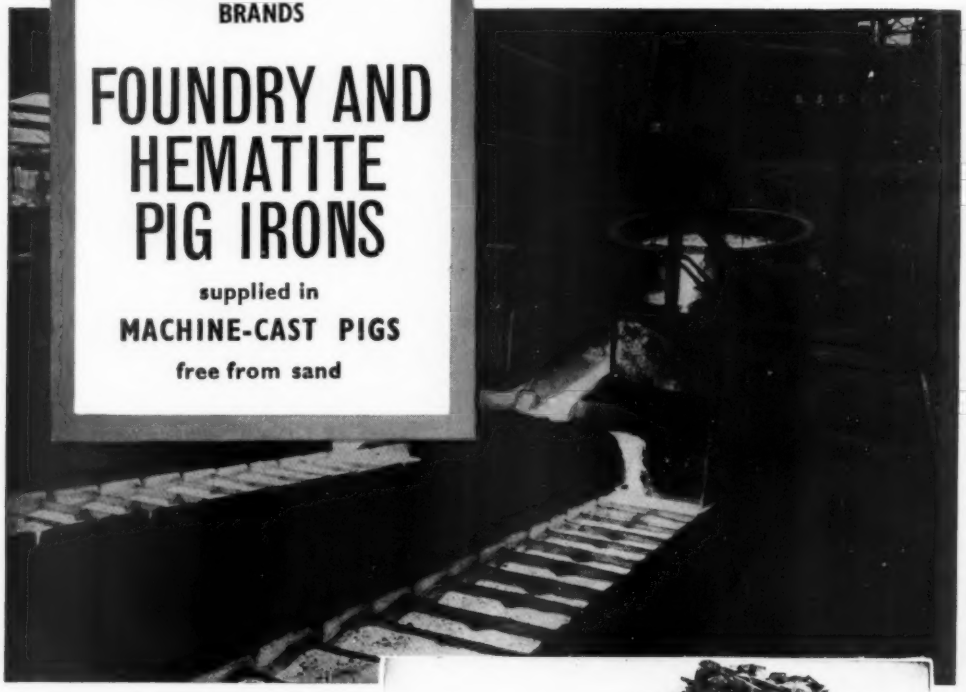

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PRINCIPAL CONTENTS

PAGE

Spheroidal-graphite Types of Ni-Resist Austenitic Cast-iron

By Dr. A. B. Everest, London, and Dr. O. Nickel, Dusseldorf.

Description of the properties and processes of the material is followed by illustrated examples of its application in various foundries 515

Protection of Industrial Designs

By Lord Meston

An explanation of features of the existing law, and its definitions, is supplemented by a section dealing with the copyright given by the registration of a design 523

Ironfounding Health and Safety

Further reports of the CFA Conference held in Blackpool 528

Types ductiles de Fonte austénitique "Ni-Resist." Par Dr. A. B. Everest, London, et Dr. O. Nickel, Düsseldorf. On fait suivre la description des propriétés et des procédés des matériaux, par des exemples illustrés de son utilisation dans diverses fonderies. 515

Protection des Modèles industriels. Par Lord Meston. Une explication des termes de la loi en existence, et des définitions sont complétées par un passage traitant des droits de copie conferés par l'enregistrement d'un modèle 523

Santé et Sureté en Fonderie 528

Austenitisches "Ni-Resist"-Gusseisen mit Kugelgraphitgefüge. Von Dr. A. B. Everest, London, und Dr. O. Nickel, Düsseldorf. Auf eine Beschreibung der Eigenschaften und der Herstellungsweise dieses Werkstoffes folgen illustrierte Beispiele seiner Anwendung in verschiedenen Giessereien. 515

Musterschutz industrieller Konstruktionen. Von Lord Meston. Eine Erklärung der charakteristischen Merkmale des bestehenden Gesetzes und seiner Begriffsbestimmungen, ergänzt durch einen Abschnitt, welcher das durch Eintragung einer Konstruktion erlangte Urheberrecht behandelt 523

Gesundheit und Sicherheit in Eisenhutte 528

Features, News, Commercial Information and Statistics

Leader: Propaganda for Copper-base Castings 513
Forthcoming Events 514
Atlas Copco Share Issue 524
Chamberlain Group acquire Grant, Lyon & Company 524
Equipment and Supplies 525
Company News 526
Mechanical Handling Exhibition 527
Notes from the Branches 534
News in Brief 535
Personal 538
Raw Material Markets 540
Current Prices of Iron, Steel and Non-ferrous Metals 542

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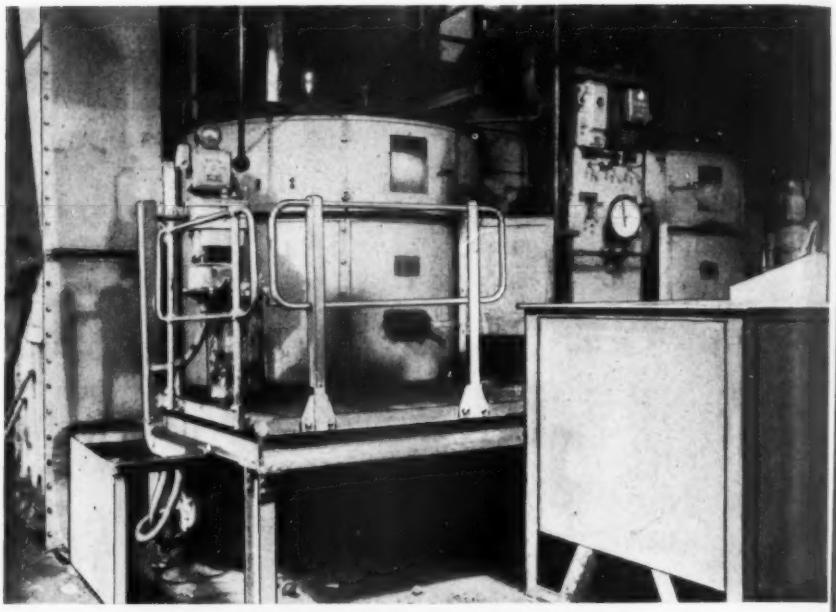

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FOUNDRY
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Propaganda for Copper-base Castings

Trends in industrial practice which have their origin in America often spread over the rest of the world, and those affecting the foundry industry may follow the same generalization. Thus it is important to observe that at the moment, in that country, brass and bronze founders are perturbed at the competition which is being experienced from suppliers of alternatives, *e.g.*, bearing materials, plastics, fabricated assemblies and light alloys. In this country, the railways are rapidly replacing the use of cast-brass bearings by ball- and roller-bearings and so the sad story could be extended in other fields. But it is no use reacting ostrich-like in face of such trends.

Being increasingly aware of the situation, the Association of Bronze and Brass Founders is proposing to launch an expanded propaganda campaign to increase the sales of their products, and recently, the London section of the Association heard a lucid statement from Mr. W. R. Buxton of the present position and the potential fields for exploration. In following the terms of reference set out by the ABBF Council, Mr. Buxton was assiduous in his duties and had discussions with the Copper Development Association, the director of the Science Museum, the London County Council, training schools and the technical Press. He familiarized himself with the activities of other foundry employers' associations and asked what ABBF members, with an annual turnover of £11 million, could best do to promote sales. A first and obvious fact is that the more the Association represents bronze and brass founders as a whole—by reason of increased membership—the more money will be available for propaganda work and the promotion of industry-wide sales.

No propaganda campaign will be successful unless it is backed up by the making of really high-grade castings and one suggestion here was the introduction of a labelling scheme for high-quality products, such as is in vogue in France. The field for publicity is wide and to implement everything the copper-base founders have in mind will indeed be costly, for it includes much more intensive research and subsequent development; the showing at appropriate exhibitions, and joint conferences with designers—to mention but a few. With the limited finance immediately available, we deem it advisable initially to narrow the field to the men who most matter, that is, the designers. To attain and retain their interest in the heavy non-ferrous alloys, they must have on their desks an authentic work of reference covering the dual aspects of designing for foundry production and the properties of new and improved alloys available. Propaganda of this sort is not a radical departure, for it has been carried out successfully by British steelfounders, whilst the UK makers of grey-iron castings, operating in a much wider field, have also achieved noteworthy results. They, and the Gray Iron Founders' Society of America in recent years have directed substantial effort towards the preparation of data books covering their productions and also to the stressing of the need for intelligent costing. The fact that brass and bronze founding dates back to 3500 B.C. is more of a liability than an asset. The present and future are the concern of to-day's founders, and much new development work and an enlightened policy will be needed to re-establish these metals amongst competitive materials. To enlist the co-operation of the engineering designer must be a cardinal point in any such campaign.

Need for Better Training

If the foundry industry did not wish to recruit only the discards from other industries, then it must combat popular prejudice and provide competitive training facilities, said Mr. H. G. Hall, chairman of the Walsall Foundry Trade Joint Recruitment and Training Committee, when he spoke at the second annual dinner of the Committee. "The foundry is a good place to work in and we are entitled to the best and not the worst of the school-leavers," he said.

Outlining suggestions for training senior employees of the future, Mr. Hall said there was, and would be, a desperate shortage of foremen, and chargehands and of men for the higher positions. In the past these positions had been filled by metallurgists, upgraded moulders and patternmakers, but none of these truly filled the needs of the modern foundry. The metallurgist often did not like handling labour or management problems, and the craftsman rarely had the technical education needed to translate modern research ideas into sound and practical foundry production. To staff the foundries of the future it would be essential to use men who were versed in moulding, patternmaking, metallurgy and production engineering and who had ability to control labour. Such men, said Mr. Hall, could not be recruited unless their careers and technical education were as clearly defined as those of the engineer and metallurgist.

Prejudice to be Overcome

He went on to say that facilities already existed and it needed only a judicious mixture of metallurgy, engineering, and foundry practice to provide clear-cut courses for the foundry technologist and foundry technician. Such courses would be valueless, however, unless they could overcome the prejudice in the minds of parents and teachers. These people believed that a foundry was a dirty place and that a foundryman was socially inferior to a white collar worker. Yet, said Mr. Hall, there was no industry where a man prepared to accept responsibility could rise so rapidly and find such satisfaction as in the foundry trade. The Walsall Committee had intensively pursued a programme for overcoming popular prejudice and was now urging that facilities for simple mould making and low-temperature casting be provided for seniors at local schools.

Guest of honour at the dinner was Sir Frederick Scopes, chairman of Stanton Ironworks Company, Limited, Chamberlin & Hill, Limited, and the National Foundry College, Wolverhampton. In a message to apprentices Sir Frederick told them that with the necessary determination, their prospects in the foundry trade were almost unlimited, and urged them to correct any educational weaknesses such as in mathematics or English. Other speakers included Mr. F. C. Haynes, education and training officer of the Council of Ironfoundry Associations. He spoke of the spectacular opportunity in an industry which the public did not consider glamorous, but deplored the lack of youths with all-round training. He said that the training committee of the Council was trying to remedy this and had proposed a City and Guilds certificate in craftsmanship.

Sir Frederick presented awards to apprentices and promised to give an award for the outstanding apprentice of the year. The chairman announced that there were 39 apprentices attending the local technical school.

Forthcoming Events

MAY 2

Institute of British Foundrymen

Sheffield branch: Annual general meeting followed by a discussion on foundry topics, 7 p.m., at the College of Commerce and Technology, Pond Street, Sheffield.

MAY 2 to 4

Institute of Physics

Joint meeting of the non-destructive testing group of the Institute and the *Société Française de Métallurgie* at 47, Belgrave Square, London, S.W.1. The general theme will be the relationship between the structure and physical properties of materials, and recent advances in non-destructive-testing techniques. On May 3 the annual dinner of the Institute will be held at the Park Lane Hotel, 7 for 7.30 p.m.

MAY 3 to 4

Institute of Metals

Joint meeting on "The Determination of Gases in Metals," organized by the Society for Analytical Chemistry, in conjunction with the Iron and Steel Institute and the Insitute of Metals, at Denison House, 296, Vauxhall Bridge Road, London, S.W.1 (*not* Church House, Westminster, as originally planned).

Armstrong-Whitworth Presentation

To mark his recent retirement from executive duties after 30 years' association with the company, Mr. Charles Pullan, sales director of Armstrong-Whitworth (Metal Industries), Limited, was presented with a gold watch by the chairman, Sir Adrian Jarvis, Bt., A.C.A. In the accompanying photograph Mr. Pullan (standing right) is shown receiving the watch from Sir Adrian. Other members of the board present were (seated from left to right) Mr. F. L. Turnbull, O.B.E., T.D., Sir William Scott, O.B.E., J.P., Mr. F. J. W. Williams, Q.C., and Mr. R. H. Philip. Mr. F. L. Turnbull, formerly director and works manager, now becomes director and general manager, and Mr. R. H. Philip, formerly director and secretary, has become commercial director and secretary.

Spheroidal-graphite Types of Ni-Resist Austenitic Cast Iron*

By Dr. A. B. Everest, London, and Dr. O. Nickel, Dusseldorf

The spheroidal-graphite types of the austenitic Ni-Rest cast irons contain 2.4-3.0 per cent. carbon, 20-36 nickel, up to 5.5 chromium, and sometimes high proportions of silicon and manganese, according to the particular properties required. Their heat-treatment, machineability and weldability are discussed in this paper. The tensile strength of the material ranges from 19 to 32 tons per sq. in., with elongation values up to 40 per cent.; some of the types are non-magnetic. S.-g. Ni-Resist shows the general good resistance to corrosion and heat of the austenitic irons, and has good strength at elevated temperatures; some types also show good wear-resistance. According to composition, irons in this range have coefficients of thermal expansion varying from 5 to 18.7 $\times$ 10^{-6} per deg. C. A number of examples of applications of s.-g. Ni-Resist castings are given in the latter half of the paper.

In the early 1920s, metallurgists throughout the world directed their studies to the influence of various alloy additions on cast iron. This led to the development of several new types of iron castings. Work on the addition of nickel led to the realization that at different proportions of nickel addition, cast irons with a wide range of characteristics could be produced. A. B. Everest, T. H. Turner and D. Hanson[1] showed that with a 20-per cent. addition of nickel to cast iron the characteristic transformations in the iron/carbon alloys are reduced to below room temperature, and castings with a fully austenitic structure are thereby obtained. This led to the development of cast iron with new properties, and notably with a high degree of corrosion-resistance. Compared with ordinary grey iron, castings with greatly improved resistance to heat and oxidation could be made. Additionally, it was found that several of these special irons were non-magnetic, and again have other unusual characteristics, such as a wide range of thermal expansion coefficients.

The production of austenite in cast iron is promoted also by the addition of other alloying elements, for example by means of manganese. Because, however, of the high carbon content in cast iron, the use of manganese is limited by the formation of hard carbides. Manganese alone therefore is not suitable as an alloying element for the production of austenitic cast iron, but is useful in combination with other elements such as nickel. This is realized in the well-known non-magnetic cast iron "Nomag."† Chromium also is often added to the nickel-alloyed austenitic cast irons, to increase their oxidation and corrosion-resistance. The quantity of chromium which can be added is, however, again limited, since chromium is a strong carbide stabilizer.

* Translation of a paper presented at a joint meeting of the *Verein Deutscher Giessereifachleute* and *Verein Deutscher Ingenieure*, at Stuttgart last January. The paper is reproduced, with permission, from *Konstruktion*, 1959, **11**, 10. 390-395.

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Development of the Ni-Resist Alloys

J. S. Vanick and P. D. Merica[2] described in 1930 an austenitic cast iron in which approximately six per cent. of nickel is replaced by the same amount of copper. The range of Ni-Resist alloys has been developed from this basis, the original iron being known initially as "Nimol." The term Ni-Resist to-day, however, covers not only this original austenitic iron but also a whole series of irons with a wide range of composition, nickel varying from 15 to 36 per cent. This range includes individual types which have been developed to provide one or other special property. The chief properties of this series of irons are as follows: Corrosion-resistance; heat- and oxidation-resistance; high or low thermal expansion; special resistance to wear and galling, and non-magnetic properties.

By reason of their relatively high carbon content, ranging generally from 2.4 to 3.0 per cent., the various types of Ni-Resist are easily castable. In the normal grades carbon is thrown out of the melt during cooling in the form of graphite flakes. The austenitic irons are in general tougher and more resistant to shock than are the low or non-alloyed types of iron, but because of the graphite flakes in their structure their mechanical properties are relatively low and the castings, like other types of flake-graphite iron, are generally weak. The mechanical strength of the normal Ni-Resist irons is of the order of 12 to 15 tons per sq. in., with an impact strength still on the low side though somewhat higher than for normal iron.

PROPERTIES AND PROCESSES OF AUSTENITIC CAST IRONS WITH SPHEROIDAL GRAPHITE

After the Second World War, methods were announced whereby the graphite in cast iron could be induced to separate during cooling in the form of spheroids, as opposed to the normal flake form. Cast irons with spheroidal graphite quickly developed and were accepted by engineers as a new

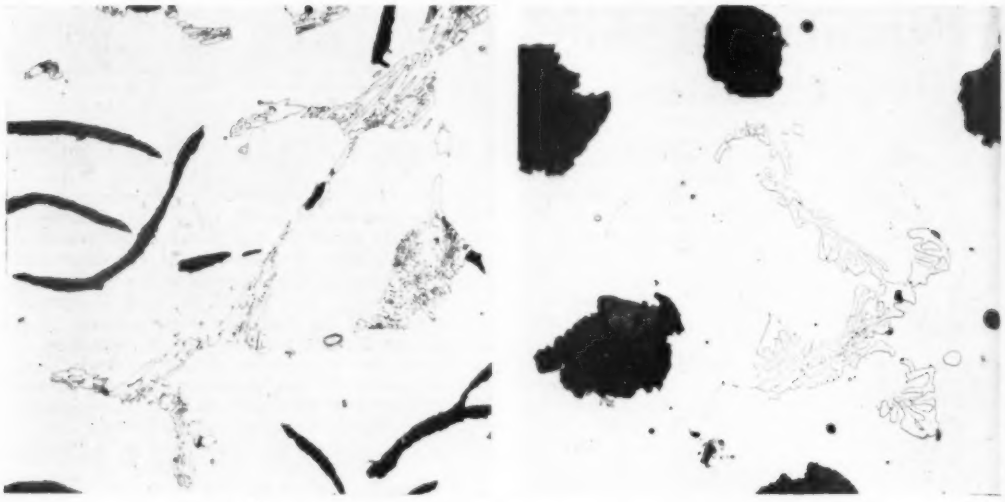


FIG. 1.—*Microstructures of* (a) (*left*) *normal Ni-Resist, and* (b) (*right*) *spheroidal-graphite Ni-Resist* (×250 *etched*).

material of construction. The process of modifying the graphite can be applied to all types of grey cast-iron. The production of these irons depends on a special treatment of the melt, generally with magnesium. The application of this method to the austenitic irons has led to the range of s.-g. Ni-Resist irons, which is the subject of this paper.

TABLE 1.—*Composition Ranges of the S.-g. Ni-Resist Irons (per cent.).*

Type.	C	Si	Mn	Ni	Cr
D2	max. 3.00	1.75—3.00	0.70—1.00	18.00—22.00	1.75—2.50
D2B	max. 3.00	1.75—3.00	0.70—1.00	18.00—22.00	2.75—4.0
D2C	max. 2.90	2.00—3.00	1.80—2.40	21.00—24.00	max. 0.50
D3	max. 2.60	1.50—2.80	max. 0.50	28.00—32.00	2.50—3.50
D3A	max. 2.60	1.50—2.00	max. 0.50	28.00—32.00	1.00—1.50
D4	max. 2.60	5.00—6.00	max. 0.50	29.00—32.00	4.50—5.50
D5	max. 2.40	1.50—2.75	max. 0.50	34.00—36.00	max. 0.10
D5B	max. 2.40	1.30—2.75	max. 0.50	34.00—36.00	2.00—3.00

Improved Mechanical Properties

Whereas in grey cast-irons with flake graphite, the carbon particles break up the matrix, thus substantially reducing its strength, this is not the case when the graphite is rendered spheroidal. The spheroidal form of graphite eliminates the stress-raisers and notch effects associated with flake graphite. The Ni-Resist types of iron with spheroidal graphite retain all the outstanding features of the austenitic irons, with at the same time a marked improvement in their mechanical properties.

The tensile strength of s.-g. Ni-Resist ranges from 24 to 32 tons per sq. in., *i.e.*, about twice the strength of the corresponding flake-graphite types. The resistance to impact is also considerably improved, and high elongation values even up to 40 per cent. can be attained. Since copper is a disturbing element in the formation of spheroidal graphite, its use to replace part of the nickel in s.-g. Ni-Resist is strictly limited, and generally it should not exceed 3 per cent.

Types for Special Applications

Fig. 1 shows how the structure of Ni-Resist is modified by magnesium treatment. Without treatment the structure of Ni-Resist shows some carbides, but with the bulk of the carbon present as graphite flakes (Fig. 1(*a*)). When magnesium treated, the graphite separates in the spheroidal form while the carbides remain unchanged (Fig. 1(*b*)). In Table 1 the chemical composition of the various types of s.-g. Ni-Resist is shown, and Table 2 lists some mechanical and physical properties of these irons[3]. Types D2 and D2B are recommended when resistance to corrosion, erosion, wear and heat up to 760 deg. C. are required; both types show a high thermal expansion.

Type D2C is used where medium resistance to heat and corrosion is required, but where high ductility is important, as, for example, in components which have to be welded. This type also retains its properties well at low temperatures, and

is recommended for use below 0 deg. C.

Type D3A is used on account of its good frictional properties for components required to show resistance to wear and corrosion, with at the same time medium thermal expansion characteristics. Type D4 is specially alloyed with high additions of nickel, chromium and silicon to give it special high resistance to corrosion, erosion and oxidation. Types D5 and D5B are characterized by their low thermal expansion, and are useful for precision machine components, scientific instruments, glass moulds and similar purposes. Type D5 retains its properties at low temperatures to an outstanding degree, even down to −196 deg. C.

TABLE 2.—*Mechanical and Physical Properties of the S.-g. Ni-Resist Irons*

Type.	D2	D2B	D2C	D3	D3A	D4	D5	D5B
Tensile strength (tons per sq. in.)	24.5—31.0	26—31	24.5—29.0	24.5—30.0	24.5—29.0	27—32	24.5—27.0	24.5—29.0
0.2 per cent. proof stress (tons per sq. in.)	14—16	14.7—16.5	13.0—15.7	14.7—16.5	14.5—17.5	17.0—19.5	13.2—15.7	15.7—18.7
Elongation on 2 in.	8—20	7—15	20—40	7—18	13—18	1.5—4.0	20—40	5—10
Elastic modulus (lb. per sq. in. × 10^{-6})	16.5—18.5	16.5—19.0	15	13.5—14.5	16.0—18.5	13	16—20	16.0—17.5
Brinell hardness	140—200	150—210	130—170	140—200	130—190	170—240	130—180	140—190
Specific gravity	7.41	7.45	7.41	7.45	7.45	7.45	7.68	7.72
Melting point (deg. C.)	1,240	1,260	1,240	1,240	1,240	1,205	1,240	1,240
Coefficient of thermal expansion per deg. C. (20—200 deg. C.) × 10^{-6}	18.7	18.7	18.4	12.6	12.6	14.4	5.0	5.0
Magnetic properties	Non-magnetic	Slightly magnetic	Non-magnetic	Magnetic	Magnetic	Slightly magnetic	Magnetic	Magnetic

Machinability

The chromium-alloyed types of Ni-Resist contain carbides in proportion to their chromium content, and these tend to impair machinability. The machinability of the s.-g. type of Ni-Resist lies roughly between that of a fine-grained pearlitic grey cast-iron with 220 Brinell hardness, and that of the high-tensile acicular nickel-molybdenum cast iron with approximately 275 Brinell hardness. Some values for the recommended cutting speeds and feeds are collected in Table 3. The lower values of the cutting speeds are to be chosen for rough machining, for example, in removing the casting skin. The higher values are recommended for finishing cuts.

The machinability of s.-g. Ni-Resist type D2C corresponds to type D2. Type D3 is more readily machined than type D2B. Type D4 s.-g. Ni-Resist is somewhat more difficult to machine than D2B, and it is to be recommended that the lower cutting speeds should be used. Type D5 can be machined under similar conditions to type D2. Further details, especially on coolants, cutting angles, speeds for milling, as well as for honing and lapping are contained in the literature[4].

Welding

All the different types of s.-g. Ni-Resist are readily weldable. For electric welding a 50/50 nickel-iron electrode is generally suitable. Weld deposits produced with such electrodes can be machined, have a high corrosion-resistance, but are magnetic. If non-magnetic weld deposits are required, austenitic steel electrodes must be used. S.-g. Ni-Resist can also be welded by gas methods, generally using welding-rods of the same composition as the parent metal.

Heat-treatment

Since all Ni-Resist when fully alloyed is austenitic, and undergoes no transformations during heating and cooling, no heat-treatments of the hardening and tempering types are possible. Other types of heat-treatment can usefully be employed as follows:

Residual Stresses: arising during casting or on machining are removed by stress-relief heat-treatment, generally consisting of one hr. per in. of section, in the range 620-680 deg. C., followed by air cooling. Welded Ni-Resist components should always be stress-relief heat-treated.

TABLE 3.—*Cutting Speeds and Feeds for S.-G. Ni-Resist.*

Type	Cutting speeds (surface ft. per in.)			Feed (in. per turn, max.)
	High-speed steel tool.	Stellite tool.	Carbide tool.	
D2	35—60	45—75	130—225	0.018
D2B	20—40	35—60	100—150	0.018

Excessive Hardness: If the hardness exceeds 190 Brinell, the machinability of the castings can be improved by annealing for between ½ to five hr. at 950-1,040 deg. C., followed by air or furnace cooling. This gives a more favourable form and distribution, as well as a partial solution, of the carbides. Such treatment not only reduces the Brinell hardness to 180 or less, but the mechanical properties are also further improved. In particular, strength and elongation are raised. By annealing at 930-1,010 deg. C. part of the carbon may be dissolved and kept in solution during quenching. This gives a further improvement in strength. As a result of the lack of transformation during cooling

Spheroidal-graphite Types of Ni-Resist

of these alloys, the danger of the formation of cracks during quenching is eliminated.

High-temperature Service: Ni-Resist castings which in service are exposed to temperatures exceeding 500 deg. C. may show some distortion if they have not previously been heat-treated. Accordingly, castings for high-temperature service should, in general, be given prior treatment, such as at least two hr. at 870 deg. C., furnace cooled to 540 deg. C. and then air cooled. This ensures that the carbon in the casting is in a state of equilibrium, and no distortion or growth at elevated temperatures should occur in service.

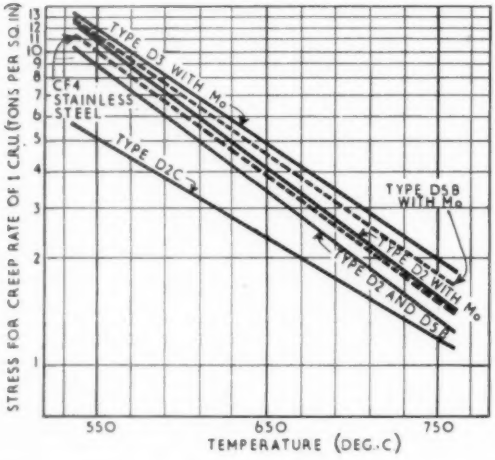


FIG. 2.—*Comparison of the creep strengths of several types of s.-g. Ni-Resist, with 18/8 chromium-nickel cast steel. (Note: 1 c.r.u. = 1 per cent. creep in 10,000 hr.)*

Stability: In order to guarantee the maximum stability in machined castings, the following heat-treatment is recommended. Anneal for two hr., plus a further hr. for each one in. section at 870 deg. C.: cool in the furnace at a maximum of 50 deg. C. per hr. to 540 deg. C.; hold for one hr. per in. section, and then slowly cool. The component is machined and re-heated to 450-480 deg. C., held for one hr. per in. section, and then cooled. Any final machining necessary is then effected, and the component should then be re-heated to 260-310 deg. C. and slowly cooled[3].

Resistance to Various Influences

Resistance to Wear and Galling

The graphite present in s.-g. Ni-Resist ensures that the metal has good wear-resistance. In addition, the austenitic matrix shows work-hardening under load on bearing surfaces, thus further increasing resistance to wear and seizing between sliding components. Wear-resistance may again be further raised by the addition of chromium or phosphorus, which occur as hard phases in the structure. For the best characteristics in service the carbides should be present in finely distributed form. Coarse carbides lead to the premature wear of the opposing material. It therefore follows that the medium-chromium types are most suitable for bearing surfaces. Types D2, D2C, D3A and D4 are not only relatively wear-resistant at room temperature when in rubbing contact against many other metals, but they also show good wear-resistance at both low and high temperatures, even up to 800 deg. C.[3, 5]

S.-g. Ni-Resist is thus a suitable material for cylinder liners in pumps and motors, for pistons, piston-ring carriers, piston rings, bearings and bushes in contact with other types of Ni-Resist, stainless steel, Monel* or alloyed grey cast-iron. For the best results it is often important that the Ni-Resist surfaces should be well run-in under conditions leading to some degree of work-hardening. This running-in process should be performed with care and, particularly for high-temperature purposes, lubrication with molybdenum disulphide is recommended. Ni-Resist is especially suitable where resistance to frictional wear and to corrosion are simultaneously required, as is often the case in the chemical industry.

Resistance to Erosion and Cavitation

The s.-g. types of Ni-Resist are highly resistant to erosion and cavitation, especially in the higher chromium grades, which are particularly suited for handling wet steam, salt solutions and free-flowing corrosive and abrasive fluid mixtures generally.

Resistance to Corrosion

S.-g. austenitic irons are much superior to ordinary grey cast-iron in their resistance to corrosive attack by acids, alkalis, industrial waters, sea-

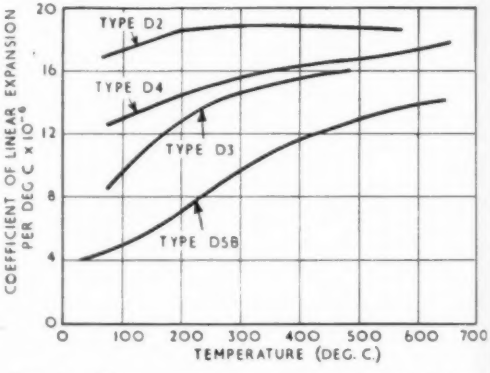


FIG. 3.—*Mean coefficients of expansion of different types of s.-g. Ni-Resist.*

water and many other media. In a series of corrosion experiments the s.-g. Ni-Resist irons were compared with the normal flake-graphite type. Results available to date show that the corrosion-

* Registered Trade Mark.

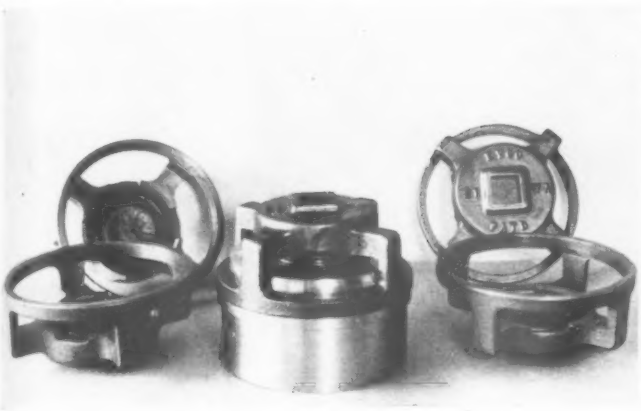
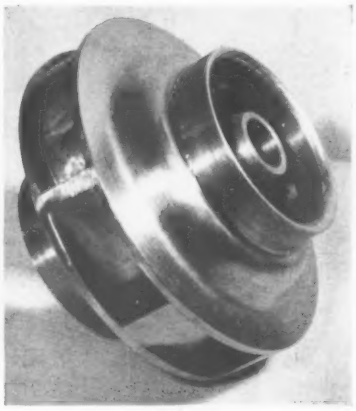


FIG. 4.—*Pump valve cages in s.-g. Ni-Resist type D2, for corrosion and erosion resistance.*



(*Courtesy: G. & J. Weir, Limited.*)

FIG. 5.—*S.-g. Ni-Resist impeller for a boiler feed pump.*

resistance of the s.-g. types is about the same as that of the corresponding flake-graphite types. Extensive corrosion data is available in the literature.[3, 6, 7]

Heat Resistance

As a result of their high alloy content, the Ni-Resist types of iron are more resistant to oxidation and growth at elevated temperatures than is ordinary grey iron. The structure does not transform but remains austenitic during heating and cooling, and transformation stresses do not arise. For operating temperatures above 700 deg. C., types D2B, D3 and D4 are specially suitable on account of their higher chromium content. S.-g. Ni-Resist is used for furnace castings and engine components such as turbo-chargers, manifolds and valve guides.

Mechanical Properties at Elevated Temperatures

R. D. Schelling and J. T. Eash[8] have demonstrated that the various grades of s.-g. Ni-Resist possess remarkable strength at elevated temperatures, and that this strength can be further increased by the addition of up to 1 per cent. of molybdenum. The creep characteristics of types D2, D3 and D5B s.-g. Ni-Resist with molybdenum are similar to those of the austenitic 18/8 chromium-nickel steel. The curves in Fig. 2 show a comparison of the creep strength of various types of s.-g. Ni-Resist with and without molybdenum, and for comparison include the figures for the stainless 18/8 chromium-nickel cast steel at temperatures up to 700 deg. C. These figures show that s.-g. Ni-Resist is a very suitable material for components operating under stress at elevated temperatures.

Types D5 and D5B are especially resistant to thermal shock, and are used for components exposed to cyclic heating and cooling. The alloys are resistant to distortion and cracking, once again due to the absence of critical transformation in the metal. Any separation of graphite which might lead to distortion can be prevented by the stabilizing heat-treatment already discussed above.

Thermal Expansion

The thermal expansion of the austenitic cast irons varies over a wide range according to the alloy content. Ni-Resist with about 20 per cent. of nickel has a high coefficient of thermal expansion at about 18.7×10^{-6} per deg. C. These alloys are therefore very suitable for working in conjunction with the light alloys, since they have similar expansion characteristics. With a higher nickel content the coefficient of expansion decreases and reaches a minimum at approximately 36 per cent. of nickel, when it is about 5×10^{-6} per deg. C. In this respect these cast irons resemble the pure nickel-iron alloys in which the 36-per cent. alloy, often known as Invar, possesses a minimum expansion. Fig. 3 shows the mean coefficients of expansion of some of the s.-g. Ni-Resist

FIG. 6.—*Eight-inch general-purpose valve in s.-g. Ni-Resist, to meet requirements of high strength and corrosion and erosion resistance.*

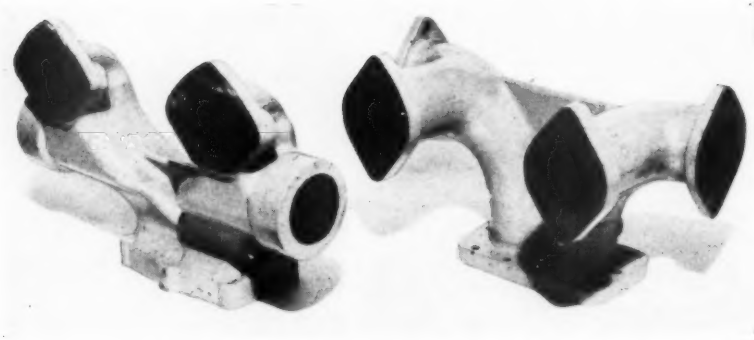


FIG. 7.—*Ni-Resist exhaust-manifold castings for turbo-blown diesel engines. The casting on the left is in s.-g. Ni-Resist.*

(Courtesy: John Williams of Cardiff, Limited.)

types. A suitable alloy in this series may be selected to match the expansion of many other metallic materials.

High Thermal Expansion

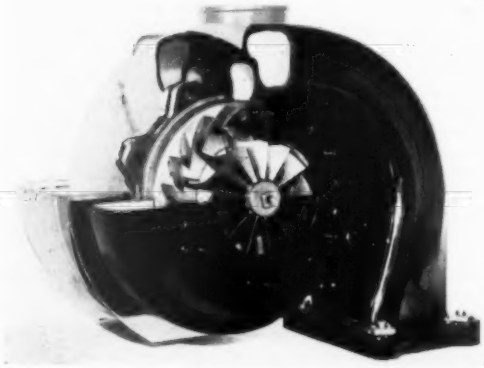
The high-expansion type D2 is particularly suitable for parts working in conjunction with aluminium alloys, copper, bronze and the austenitic stainless-steels. Ring carriers and piston caps made of Ni-Resist fitted in aluminium pistons are examples of an application in which the rate of expansion of the different metals must be matched in order to prevent distortion, or opening-up of the joint between the components. Another example is found in turbo-chargers, where the Ni-Resist casing must match the thermal expansion of the rotor components, which are often made in austenitic stainless-steel.

Low Thermal Expansion

Types D5 and D5B s.-g. Ni-Resist, containing 36 per cent. of nickel, show the minimum coefficients of expansion in the series. These alloys are valuable when accuracy and maintenance of dimensions is important, for example in precision machine-tool components, glass moulds and gas-turbine casings. Glass moulds made of this alloy retain a smooth surface, and their dimensional stability guarantees the correct dimensions of the finished product.

FIG. 8.—*Sectioned turbo-charger for a diesel engine, with Ni-Resist turbine casing. S.-g. Ni-Resist is frequently used for this application.*

(Courtesy: John Williams of Cardiff, Limited and Holsett Engineering Company, Limited.)



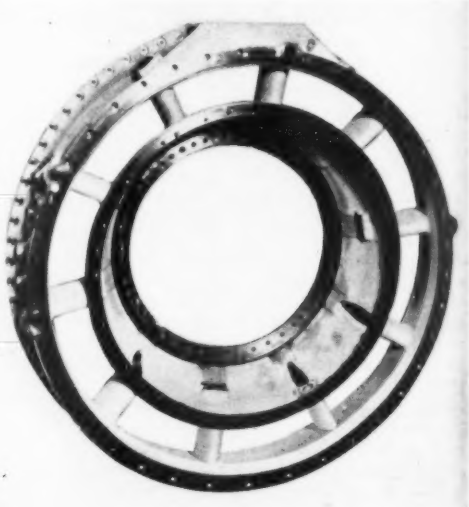
Properties at Low Temperature

Various grades of s.-g. Ni-Resist show a good notched impact value at low temperatures, even down to −196 deg. C. For this purpose type D5 is especially suitable. Table 4 shows the notched impact strength of these alloys at low temperature.

TABLE 4.—*Notched Impact Strength of S.g. Ni-Resist at Low Temperatures.*

Temperature (deg. C.)	D2	D2C	D3	D3A	D5	D5B
Room temperature ..	12.5	28.0	7.0	14.0	17.0	5.5
−18	11.5	15.0	—	14.0	15.0	5.5
−73	10.0	6.5	6.5	13.0	14.0	4.5
−196	4.5	4.0	3.5	7.5	11.0	4.0

FIG. 9.—*Main bearing support for aircraft jet-engine, in which s.-g. Ni-Resist is used for the inner and outer ring castings. The 18/8 chromium-nickel stainless-steel vanes joining the rings are attached by welding.*



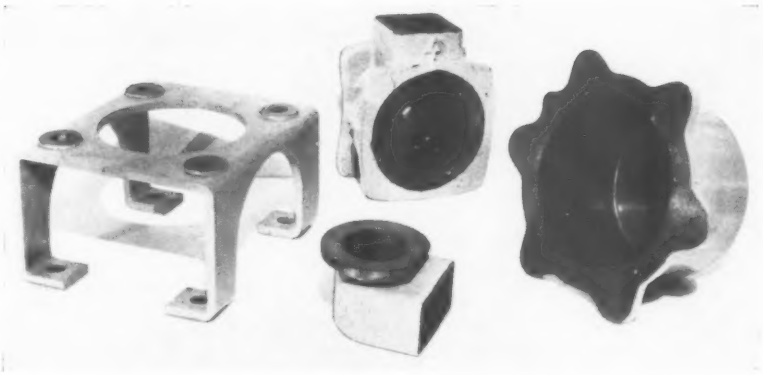


FIG. 10. — *S.-g. Ni-Resist non-magnetic castings for British Transport Commission automatic train control. These castings support and house the pick-up carried on the locomotive.*

(Courtesy: John Williams of Cardiff, Limited.)

Magnetic Behaviour

Types D2 and D2C s.-g. Ni-Resist are non-magnetic and can therefore be applied where magnetic and eddy-current losses must be kept to a minimum. For non-magnetic castings the chromium content should be low, since the carbides it induces in the structures are themselves magnetic.

APPLICATIONS

The wide range of mechanical and physical characteristics of the s.-g. series of Ni-Resist leads to their very wide application under many different types of service. Only a few examples of applications can be discussed here. Many others are found in the literature[3]. Typical applications can be roughly classified as follows: (*a*) Components with good corrosion-resistance; (*b*) components requiring wear-resistance combined with other special properties; (*c*) components for which resistance to heat is required, combined generally with strength at high temperatures; (*d*) non-magnetic castings, and (*e*) applications requiring special expansion control.

Corrosion-resistance

The various grades of s.-g. Ni-Resist are suitable for complicated castings such as valves and pumps, especially when high pressures are involved. In the chemical industry components such as the pump-valve cages shown in Fig. 4 are successfully cast in s.-g. Ni-Resist. Applications for pumps, as shown in Fig. 5, are interesting, since for these items copper must be absent. Fig. 6 shows a valve for general use, especially in the petroleum industry. S.-g. Ni-Resist may often replace stainless-steel for these applications.

Wear-resistance

Under this heading is included the application of s.-g. Ni-Resist for cylinder liners for internal-combustion engines, as well as for pumps, impellers, etc., for the conveyance of abrasive liquids. Wear-resistance at elevated temperatures is valuable in these alloys in their use for bearings, furnace details and so on.

Resistance to Heat, and Strength at High Temperatures

S.-g. Ni-Resist is becoming increasingly important for components of heavy-duty diesel engines. With increasing power and efficiency in the engines, higher exhaust-gas temperatures are encountered and heavier demands made on materials of construction. The highly-alloyed Ni-Resist irons are resistant to elevated temperatures, and are successfully used to-day for turbo-charger casings, manifolds, etc., used in conjunction with diesel engines. Fig. 7 illustrates s.-g. Ni-Resist exhaust manifolds for use in this type of application, and Fig. 8 shows a sectioned turbo-blower with Ni-Resist casing. In aircraft construction, aluminium alloys have been used generally for compressor casings

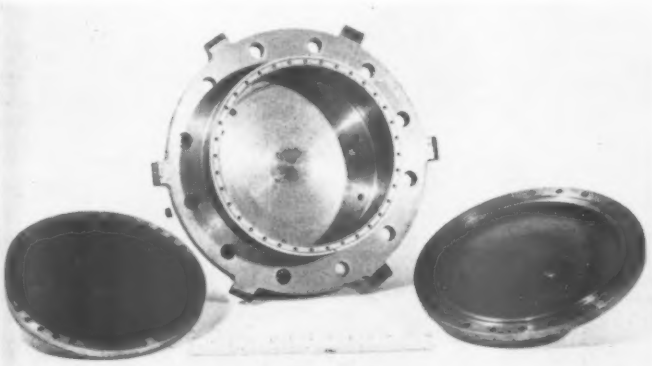


FIG. 11.—*Marine transducer housing, diaphragm and cover in s.-g. Ni-Resist. Resistance to sea-water and non-magnetic quality are required, together with impact resistance.*

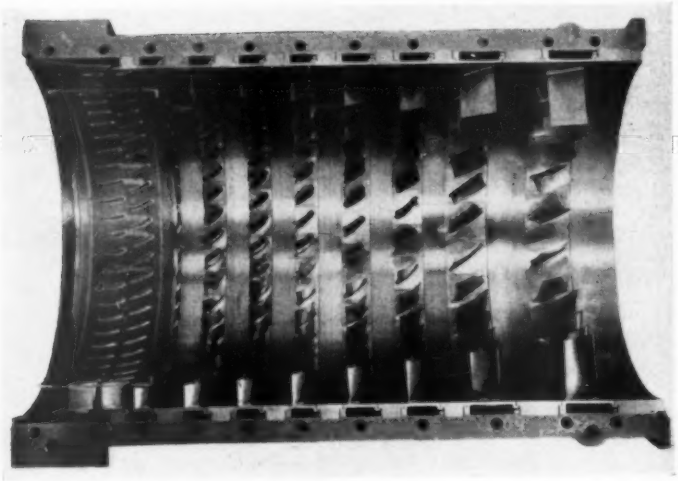
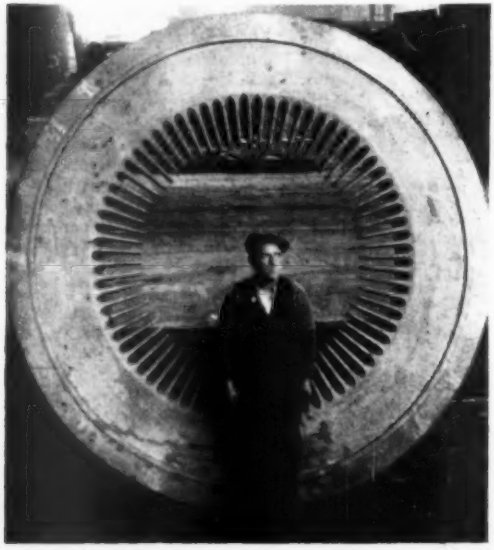


FIG. 13.—*Gas-turbine compressor housing assembly with guide vanes in position. Type D5B s.-g. Ni-Resist is used on account of its low expansion and high temperature resistance.*

and other structural components for gas turbines. With increasing speeds, operating temperatures have risen in flight, and at supersonic speed the aluminium alloys no longer meet requirements. For this reason Ni-Resist of the s.-g. type has been considered in place of light alloys, *e.g.*, for the main bearing support shown in Fig. 9, as well as for compressor casings.

FIG. 12.—*Non-magnetic s.-g. austenitic iron (NO-duMAG) alternator end clamp ring, weighing 3½ tons. The necessary requirements are high electrical resistance and non-magnetic quality, with high strength.*
(Courtesy: Ferranti, Limited.)



Non-magnetic Characteristics

The non-magnetic characteristics of the lower-alloy types of s.-g. Ni-Resist are important in electrical engineering and ship-building. Fig. 10 shows a group of castings, in non-magnetic s.-g. Ni-Resist, for the supporting structure and housing of the pick-up carried on locomotives and trains in connection with automatic electro-magnetic railway signalling. Non-magnetic castings are required to avoid interference with working of the equipment. Again, the casing of the echo-sounder transducer illustrated in Fig. 11 must combine not only corrosion-resistance but must also be non-magnetic, so as to cause no interference with the working of the electronic equipment housed in it. Fig. 12 shows a typical example of a large non-magnetic casting used in the construction of electrical generators. The s.-g. austenitic irons combine the required non-magnetic quality with high electrical resistance. Eddy-current losses are thus kept low, whilst the component—an alternator end clamp, has the required mechanical strength. Alloys in this class are also of interest for the construction of diesel engines, deck gear and the like required to be non-magnetic for use aboard mine-sweepers.

Expansion Control

Fig. 13 shows a compressor casing for a gas turbine, in which type D5B s.-g. Ni-Resist has been used to minimize thermal expansion.

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G. W. S. BURDETT & COMPANY, LIMITED—Mr. Brian S. Kingston, secretary of the company, has been appointed to the board.

Protection of Industrial Designs

By Lord Meston

In May, 1959, the President of the Board of Trade appointed a departmental committee to review the law relating to the protection of industrial designs. Mr. Kenneth Johnson, a leading member of the Bar, with an extensive practice in these matters, was appointed chairman of the committee, together with seven members—all of great knowledge and distinction. The terms of reference of the committee are: "To consider and report whether any, and if so what, changes are desirable in the law relating to the protection of industrial designs. In framing their recommendations the committee shall include consideration of the desirability of enabling United Kingdom designs to receive cheap and effective protection in other countries on the basis of reciprocity." The existing law is explained in the following article.

The existing law on the protection of industrial designs is the Registered Designs Act, 1949, as amended by the Copyright Act, 1956. There is a good deal of feeling in responsible quarters that the present law is inadequate and unsatisfactory in certain respects. These may be conveniently summarized as follow:

(1) Where articles can be "pirated" quickly from the original (*e.g.*, in the case of certain jewellery designs which can be easily copied by modern methods) the present system is too slow and cumbersome to give effective protection.

(2) The present procedure is too costly and too laborious if full protection is sought in the case of certain types of articles (*e.g.*, in the toy, jewellery and pottery trades, where the market needs first to be tested or where numerous separate designs on a single theme are involved).

(3) In the case of models (*e.g.*, toys) the more faithfully they reproduce the original object, the less chance they have of securing design registration under present arrangements.

(4) There are doubts whether, in many cases, the search for novelty now prescribed is of any value, *i.e.*, the owners of designs would in many cases be quite satisfied with protection against straight copying of their designs, and do not seek the wider protection enjoyed under the present system (*i.e.*, they prefer the "copyright" rather than "patents" approach to design protection).

(5) "Good" designs, in the æsthetic sense, which require simplicity and fitness for purpose are difficult to register under the present law, inasmuch as the simpler the design the less chance it has in passing the novelty test.

Features of the Existing System

So much for some of the principal complaints against the present system. It may now be useful to state in rather broad outline certain features of the existing system. The Registered Designs Act, 1949, provides that the proprietor of any new or original industrial design may register it, and shall then have in respect of articles bearing that design the same sort of rights that the proprietor of a patent has in respect of the patented article. The word "design" is defined as meaning "features of shape, configuration, pattern or ornament applied to an article by any industrial process or means, being features which in the finished article appeal to and are judged solely by the eye, but does not include a method or principle of construction or features of shape or configuration which are dictated solely by the function which the article to be made in that shape or configuration has to perform." "Article" is defined to mean "any article of manufacture," and includes "any part of an article if that part is made and sold separately."

A few words about the above very important definitions. There is no real distinction between "shape" and "configuration." But "pattern" and "ornament" are not quite the same; "pattern" may include shape as well. A design is something that has no market in itself, as apart from some article to which it is applied. Thus, showcards may be registrable, and so may any moulded or modelled representation. But a picture or drawing will only be registrable if it is a representation of some article.

"Novelty" is Essential

The element of "novelty" is essential. A design is not registrable under the Act "unless it is new or original, and in particular shall not be so registered in respect of any article if it is the same as a design which before the date of the application for registration has been registered or published in the United Kingdom in respect of the same or any other article, or differs from such a design only in immaterial details or in features which are variants commonly used in the trade." The whole question of novelty is essentially a matter of general impression, for which no rigid principles can be laid down. To show how complex is the problem, a difference in colour may be immaterial, but, on the other hand, it may give novelty or at least contribute to novelty.

Novelty cannot be given to a design by the use of ordinary trade variants which have long been common matters of taste or choice in the trade. Nor is there registrable novelty in making ordinary and natural alterations in a known design, for instance, alterations needed to fit into a particular

Protection of Industrial Designs

apparatus. Thus, alterations made to a "controller finger" for certain electrical machinery, which is already in extensive use, are not sufficient subject-matter for a design. There are certain exceptions to registrability under the Registered Designs Act, 1949. For example, certain articles regarded as "primarily literary or artistic in character" are excepted from registrability. Most sorts of printed paper or cards where the dominant feature is the printing are excepted from registration. Likewise wall plaques and medals are so excepted.

Design registrations are not intended to give protection to mechanical devices that are too trivial to be patented. It is only the actual shape or pattern of an article that can be registered, as distinct from general characteristics of a shape necessitated by a particular mode of construction. Moreover, if a design is to be registrable it must contain something more than a mechanical device in its simplest form.

Application to Register a Design

An application to register a design can only be validly made by the proprietor of it, that is to say by the author. Where the design was "executed by the author for another person for good consideration," that other person is treated as proprietor. The application must be made by the applicant or his authorized agent on the form laid down by the Design Rules. Then follows a certain procedure which must be carefully adopted, but need not be discussed here in detail. Let us assume now that the design is duly registered and a certificate of registration is issued to the applicant.

Copyright given by Registration

The copyright given by registration lasts for five years in the first instance. It may, on payment of a renewal fee, be twice renewed for further periods of five years. The copyright in the registered design given to the proprietor by registration is defined as "the exclusive right in the United Kingdom and the Isle of Man to make or import for sale or for use for the purposes of any trade or business, or to sell, hire or offer for sale or hire, any article in respect of which the design is registered, being an article to which the registered design or a design not substantially different from the registered design has been applied, and to make anything for enabling any such article to be made as aforesaid, whether in the United Kingdom or the Isle of Man or elsewhere."

Infringement

It will be noted that the above definition contains three headings of operations which constitute infringement, namely: (*a*) "making for sale or use"; (*b*) "importing for sale or use"; and (*c*) "dealing in" (which covers selling, hiring or offering for sale or hire). The words "make anything for enabling" in the above definition render liable for infringement manufacturers of moulds, dies, blocks, plates, etc., for making an article in a registered shape or applying it to a registered pattern. In particular, these words cover cases where such things are made in this country and exported, and the design actually "applied" to the final manufacture outside the United Kingdom. The words would cover the making (but not the sale) of sketches or patterns for an article of registered design, or the tools to be used in making it.

A Recent Case

There is no infringement unless substantially the whole of the design is taken, and not just selected elements. Thus, where the article concerned is solid, "all four views" must be reproduced in the infringement. In a recent case, the plaintiffs had registered a design in respect of its application to a metal boiler for heating and warming dishes and the like for cooking purposes. The representation of the design on the Register consisted of two photographs, front and back views of a portable independent boiler. The boiler consisted of a water-container round the back and sides of a fire, with a metal plate on the top and devices in front by means of which, at will, the effect of either a closed or an open grate could be obtained. The defendants had registered a design for application to a "combined hot-water-supply boiler and cooking stove." This design consisted of a photograph of the front view of an independent boiler shown with the fire open. It was difficult by means of this photograph alone to say how the boiler could be effectively closed. It was eventually held that the plaintiffs could not successfully allege infringement, because there was nothing approaching identity between the two designs, and obvious imitation had not been established.

Fewer unemployed in UK

That the upward trend in employment in Great Britain continues is revealed in the figures for April 11, issued by the Ministry of Labour. Between mid-March and mid-April, the numbers of registered unemployed fell by 22,000 to 391,000, and vacancies, on April 6, totalled 306,000—39,000 more than in March.

Expressed as a percentage, unemployment in April was 1.8 per cent. of the population, compared with 1.9 per cent. for March and 2.4 per cent. in April last year. The main improvement was in Scotland and the North of England, Scotland's unemployed falling from 4.3 to 4.0 per cent., and in the Northern region from 3.3 to 3.0 per cent. In Northern Ireland, 300 fewer were unemployed on April 11 than on March 14.

FOLLOWING THE REVISION in part of the regulations for admission to graduate and associate membership of the Institution of Chemical Engineers, a revised version of the pamphlet "Regulations for the admission of Student, Graduate and Corporate Members, and for the Examination of the Institution" has now been published. Copies of the booklet are obtainable from the general secretary of the Institution, Mr. J. R. Brennan, at 16 Belgrave Square, London, S.W.1.

Equipment & Supplies

Cooling Tower

Since ironfoundries have been installing water-cooled cupolas, those not very well placed, say at the side of a stream, have been faced with the problem of re-use of water. In this connection Thermotank, Limited, Helen Street, Glasgow, have designed a completely new type of cooling tower, in which a considerable saving in weight and size has been achieved by the use of a revolutionary fill material, in which the water is cooled by a counter-current of air as it passes through very closely-spaced elements. In addition to the new type of fill, the manufacturers have introduced several novel features in design and construction. The structure is fabricated from rolled-steel sections, treated against corrosion, and the casing is of galvanized sheets, with side panels which can be removed for maintenance.

The tower, which is circular in shape, contains a top-mounted fan which draws the surrounding air up through it from the bottom. The new fill, which is of tubular construction, is arranged across the inside of the tower with the channels disposed vertically, the cooling air passing up through these channels. Water enters the tower at the top, and is distributed across the surface of the fill by a centrally-mounted rotating header pipe, containing a number of perforations along its length through which the water streams on to the fill. The perforations vary in size along the length of the header to ensure an even distribution of water. The material of the fill has a high wettability, and the water passes down the walls of the channels in a thin, continuously-moving film. This ensures the maximum area of contact between the rising currents of air and the water, thus utilizing the volume of fill to its greatest capacity. A catchment tray at the base of the tower collects the cooled water for return to the appliance which it serves. Initially, the cooling tower is being made in 12 graduated sizes, the largest of which can deal with up to 90,000 gall. of water an hour; yet it has a diameter of only 20 ft., a height of 12 ft. and a total weight of 9½ tons.

Dust Collector

Dallow Lambert & Company, Limited, Thurmaston, Leicester, have introduced a new dust-collector, the Unimaster, which embodies many improvements. The unit is completely self-contained, and is claimed to reach a new standard in compactness of design, giving greater filtration area per floor space required. It has a built-in fan for handling the cleaned air which discharges upwards to avoid draughts, and an acoustic duct is available as a standard accessory where noise suppression is of special importance. Improved fabric filter elements of patent design are incorporated, and a variety of fabric materials may be fitted to suit the dust being handled. The "air cushion" filter cleaner (British and Foreign patents pending) has push-button control for fan and filter-cleaning mechanism (completely automatic cleaning is an extra), and flush-fitting, easy-access inspection doors are fitted to the fan, motor and filter.

Portable Embosser

British Automatic Company, 14, Appold Street, London, E.C.2, have introduced a portable hand embosser called the "Midgie." This machine (Fig. 1) embosses letters and numbers on hard-wearing, corrosion- and chemical-resisting Vinyl red plastic tape, which has a pressure-sensitive adhesive backing for instant and easy application to most smooth and clean surfaces. The tool is 10½ in. long, and precision-made in chrome plating. The plastic labelling is self-feeding, and all the operator has to do is to dial the letter or number required and then squeeze the handle. The plastic labels are embossed with permanently-raised letters of $\frac{5}{32}$-in. type size, the tape being ½ in. wide by 12 ft. long.

FIG. 1.—*Portable hand embosser introduced by British Automatic Company, of London.*

Lubrication-blockage Indicator

Exactor, Limited, Church Way, Edgware, Middlesex, have announced a new "trouble" indicator for use with their Exactor-Trabon centralized grease and lubricating systems. This new indicator fits into the distributor unit which feeds automatically to each bearing in turn a measured "shot" of lubricant, and is available for a wide range of operating pressures (from 250 up to 2,500 lb. per sq. in.) It is screwed into the alternate outlet, or test plug tap of each outgoing line from the master and secondary distributors, and, if a feed line is blocked, central visual or audible warning devices alert the operator. He then merely checks the indicators, and the bearing line at which the trouble has arisen is shown by a pin which, when under excessive pressure, protrudes $\frac{5}{32}$ in. out of the body of the indicator. The indicators return to the normal position automatically when the fault has been corrected, and are claimed to be completely dust, dirt and moisture proof.

Industrial Betatron: Pantak, Limited, Vale Road, Windsor, Berks, have concluded an agreement with Sierex, Limited, London, W.1, for the marketing and servicing of the Siemens 15-mev Industrial Betatron. The introduction of this equipment further expands the firm's range of industrial X-ray equipment, by adding a fully mobile unit which is capable of examining steel thicknesses of up to 16 in. An important aspect of the use of the Betatron is the use of an enlargement technique which gives an extremely high flaw-sensitivity. Enlargements of up to four times normal size are claimed, which allows the detection of fine flaws which would otherwise be difficult or impossible to observe.

DOWTY FUEL SYSTEMS LIMITED—Sir John Evetts, having relinquished his directorship of Rotol, Limited, has joined the board. Both companies are subsidiaries of the Dowty Group, Limited.

Company News

WOMBWELL FOUNDRY & ENGINEERING COMPANY, LIMITED—The interim dividend is repeated at 5 per cent. for the year ending July 31, 1960.

PRESSED STEEL COMPANY, LIMITED—In preparation for the "rights" issue, it is proposed to increase the authorized capital to £9,000,000 by the issue of 8,000,000 ordinary 5s. shares.

RADIATION, LIMITED—Gross profits before tax are up from £1,020,912 to £2,822,624 and net profits rose from £483,852 to £1,424,532. The dividend is 10 (6) per cent. and there is a bonus of 2 per cent. (nil).

BARTON & SONS, LIMITED, tube-fittings manufacturers and brassfounders, of Dudley (Worcs)—The dividend is effectively increased by 5 per cent. to 17½ per cent. with a final dividend of 12½ per cent. for 1959.

YALE & TOWNE MANUFACTURING COMPANY (materials-handling equipment, locks, hardware, etc.) of Willenhall—Highest-ever sales were achieved in 1959, the largest percentage being in materials-handling equipment. Sales totalled £51,474,242.

SOUTH DURHAM STEEL & IRON COMPANY, LIMITED—Conversion rights during March, 1960, in respect of £7,510,016 stock, were exercised by 1,792 holders of the 6 per cent. convertible second debenture stock 1978/83. The issue and allotment of 3,755,008 ordinary shares of £1 each is proceeding.

BABCOCK & WILCOX, LIMITED—Group profits fell from £3,277,626 to £523,154 and the dividend is cut by 4 per cent. to 9 per cent. with a final of 4½ (7) per cent. The company gained a tax credit of £150,137 and the net profit decline with this taken into consideration is from £1,853,919 to £673,291.

TRIPLEX FOUNDRY, LIMITED—Instead of a final dividend a further interim of 7½ per cent. is to be paid on the old capital of £200,000. Together with the 5 per cent. interim paid in December this makes a total of 12½ per cent., less tax, for the year to March 31, 1960. No further distribution in respect of that year will be made.

ENFIELD ROLLING MILLS, LIMITED—The chairman, Lord Verulam, states that the company has begun 1960, so far, with an even better level of demand than last year. The Restrictive Trade Practices Act, 1956, meant that larger and yet larger groups have been formed within the British cable industry and members are told that the tendency towards collaborative action in research and development must diminish.

BEYER PEACOCK & COMPANY, LIMITED, locomotive builders and general engineers, of Manchester—Group net loss of £1,592 was incurred in 1959, compared with a profit of £149,149 for 1958. The balance is struck after tax of £73,682 (£119,465) and after taking into account the loss of £95,686 (loss £22,454) before tax, of the subsidiary, the Anti-Attrition Metal Company, Limited. The dividend is maintained at 12 per cent. No dividend is proposed by Anti-Attrition Metal.

C. A. PARSONS & COMPANY, LIMITED, makers of steam turbines, electrical and nuclear engineers, etc., of Newcastle-upon-Tyne—The chairman, Mr. F. W. Gardner, says that the works continue to be fully employed and that this will be the case for some time to come. He warns, however, that orders obtained last year are insufficient to maintain the present exceptionally high production rate and it must be expected that some sections will be working below capacity for part of next year.

GEORGE KENT, LIMITED—Consideration for the sale of the company's steering-gear division to Cam Gears, Limited, comprises 450,000 Cam Gears £1 ordinary (valued at £2 a share) and an estimated cash balance of not less than £725,000. The exact amount of the consideration has not yet been decided upon. When the total sale price is decided, not less than £150,000 of the cash portion will be paid. The balance will be paid in 10 equal annual instalments beginning on September 30, 1962, and carrying 5½ per cent. interest.

HARRISON (BIRMINGHAM), LIMITED, brassfounders, etc.—Increase of the authorized capital from £546,000 to £1,150,000 is proposed by the creation of 2,416,000 new 5s. ordinary shares and for the capitalization of £396,000 of the company's reserves by the issue of 1,584,000 of the new 5s. ordinary shares fully paid up in the proportion of one new fully paid ordinary share for every one ordinary share held at the close of business on April 14. Group profit before tax of £340,783 showed an increase of £69,932 over 1958.

NEWTON, CHAMBERS & COMPANY, LIMITED, ironfounders, etc., of Thorncliffe, near Sheffield—Sir Peter Roberts, chairman, says that the directors intend that the group shall continue to expand, as they are confident that the long-term demand for products will steadily increase. The tempo of expansion is expected to continue, he states, and outstanding capital commitments were £866,595. It is expected that more than £1,000,000 will be spent this year.

MILES DRUCE & COMPANY, LIMITED, iron and steel stockholders, of London, W.3—The board hopes shortly to conclude negotiations for the acquisition of another subsidiary. It is also proposed to raise more capital by creating a further 240,000 preference shares and to alter the preference rights to enable the issue of up to 275,000 preference with a further provision that the resultant total of 450,000 preference may again be enlarged if required. At the same time it is proposed to raise the preference dividend rate from 6 to 6½ per cent. from July 1 and to make 6 per cent. the rate on the new preference capital.

Atlas Copco Share Issue

The Stockholm firm of compressed-air engineers Atlas Copco, AB, made a net profit in 1959 of £560,304, compared with £489,149 in 1958. The dividend is maintained at 10 per cent. and there is a bonus of 0.50 Swedish kronen per share.

To bring the company's share capital into line with the size of its assets and to retain accumulated earnings within the company, the board proposes that 14,000,000 kronen (£964,519) be transferred to share capital, which is thus increased from 49,000,000 kronen to 63,000,000 kronen. This will be done by issuing two new shares—entitled to dividends for the financial year 1960—for each seven shares held.

Chamberlain Group acquires Grant, Lyon & Company

As part of its expansion policy, the Chamberlain group of civil engineering and building construction companies has acquired Grant, Lyon & Company, Limited, civil engineers and railway contractors, of Scunthorpe. The acquisition will enable the group to enter new fields of civil engineering at home and abroad and in particular projects incorporating earth-moving, railway-siding installation, pipelaying, and blast-furnace lining wrecking and removal.

Mr. David Grant and Mr. Leslie Lyon will remain joint managing directors.

Mechanical Handling Exhibition

Time, cost and labour-saving equipment for every industry will be amongst the array of mechanical and electronic marvels which is to occupy an area of 500,000 sq. ft. at the Mechanical Handling Exhibition at Earls Court, London, from May 3 to 13. In addition to hundreds of machines and appliances, many of which will be seen in action, there will be films, working models, diagrams and pictures to give the visitor an opportunity to see and discuss with experts the latest labour-saving devices. Tickets of admission can be obtained free from Mr. H. A. Collman, Mechanical Handling, Dorset House, Stamford Street, London, S.E.1. Some of the many stands which will be of particular interest to foundrymen are dealt with in the following brief notes.

DALLOW LAMBERT & COMPANY, LIMITED (*JJ8*): A complete range of the new Unimaster dust-control units, which are completely self-contained, will be shown for the first time.

KEELAVITE HYDRAULICS, LIMITED (*EE9*): will give a comprehensive display of hydraulic units, including examples covering all types of hydraulic actuators and control equipment.

THOS. W. WARD, LIMITED (*D3*): will show their Fluid-Lift pneumatic handling system for powdered and granular materials, and the Ensign portable bulk piler. Various types of conveyor will also be demonstrated.

CARTER GEARS, LIMITED (*NN6*): A representative selection of the 10 available sizes of Carter hydraulic variable gear will be shown, including both working and static drives to demonstrate standard speed controls.

RANSOMES AND RAPIER, LIMITED (*G7*): will display the following machines: The new 1520 mobile crane; the 18/33 fork truck for loads of 8 tons at 33 in. from face of forks, and a shop truck crane for loads of 1.35 tons.

BRITISH ELECTRICAL REPAIRS, LIMITED (*HH 30*): will show a number of recent developments in lifting tackle, including manual and power-operated versions of the S-type cylindrical-load lifting-device for handling steel rolls.

BROCKHOUSE ENGINEERING, LIMITED (*GG 18*): *will* display a range of torque converters and industrial tractors, fork-lift trucks, towing tractors, etc. Industrial models for engines ranging from 25 to 1,250 h.p. will also be on show.

STEELS ENGINEERING PRODUCTS, LIMITED (*G9*): introduce some interesting developments in mobile-crane design. A representative selection of their range of diesel-electric cranes will be seen, three of which are being exhibited for the first time.

RAPID MAGNETIC, LIMITED (*DD2*): Magnetic lifting and handling equipment, extractors, and separators will be exhibited, including the company's new Liftmaster electromagnet, which will be shown handling various shapes and sizes of steel, pigs, scrap, etc.

E. BOYDELL & COMPANY, LIMITED (*F6*): Muir-Hill dumpers, loaders and shunters will be shown. The accent will be on loaders of advanced design, including the 2WL Mark II model, which combines a 50-deg. roll-back bucket action with a pry-out force of 7,100 lb.

ROBALLO ENGINEERING COMPANY, LIMITED (*FF4*): are featuring a pyramid of six sizes of a new type of ball-bearing turntable, the larger sizes being suitable for road trailers of up to 6 tons payload, and the smaller ones for all types of pallet trucks, factory runabouts, etc.

SHEEPBRIDGE EQUIPMENT, LIMITED (*FF12*): will be displaying a selection of mineral and mechanical-handling equipment, including hand-operated fork-lift trucks (both standard and extended-mast types), elevator buckets in Fibreglass reinforced plastics, and a single-deck vibrating screen.

SILVERTOWN RUBBER COMPANY, LIMITED (*MM 6*): Examples of fire-resistant PVC conveyor belting in both cotton duck and man-made fibre carcase constructions will be on display, as well as a range of wrapped ply and hand-made industrial hose for many other types of service.

PATERSON HUGHES ENGINEERING COMPANY, LIMITED (*J8B*): will highlight one of the aspects of their work in the mechanical-handling field—the handling of steel plates of all sizes, both by overhead-travelling crane and by disc-type conveyor. Also on show will be the new P.H.5 1-ton electric hoist block.

BTR INDUSTRIES, LIMITED (*GG 10*): are showing Nypac—nylon wefted belt—in a full range of constructions for the first time, and demonstrating the improved troughing and flexibility of this belting on a working conveyor. A full range of surface and underground conveyor belting will also be exhibited.

THOMAS ROBINSON & SON, LIMITED (*KK7*): A working pneumatic conveying plant, electronically controlled and incorporating electrical weighing equipment, will be the main exhibit. The Company will also exhibit a compact sifting machine, a high-capacity grading and dressing machine, and gravity and chain conveyors.

BRAY CONSTRUCTION EQUIPMENT, LIMITED (*E11*): will be showing their new Centaur tractor for the first time. The industrial version of this machine, when fitted with either or both the angle dozer and 10-ton logging winch, is useful for land clearance and levelling, and for towing heavy trailers and dump trucks.

ELECTROMAGNETS, LIMITED (*NN 3*): will have a working model of an automatically-controlled lifting magnet for handling steel plates and scrap material. A static exhibit of interest to users of mobile cranes will be the Boxmag packaged unit, which contains all the components necessary for the conversion of such cranes to magnetic operation.

BRITISH MONORAIL, LIMITED (*D4*): A new type of overhead-crane system will be shown in public for the first time, consisting of two or more parallel MonoRail runways, usually attached to convenient roof-members, covering the length of the area it is desired to service, and spanned by a bridge attached to trolleys running on the lower flanges of the runways.

GEORGE COHEN SONS & COMPANY, LIMITED (*H9 and L5*): The display on *H9* (Jones cranes) will include two mobile cranes not previously exhibited publicly in the UK—the KL 12-20M and KL 10-10 Mark III. Stand *L5* will contain a representative display of lifting and mechanical-handling equipment of all types, from lorry loaders to complete conveyor-systems.

MASSEY-FERGUSON (GREAT BRITAIN), LIMITED (*Stand E4*): The most impressive machine on this stand will be the 702 Industrial Tractor, fitted with a front-mounted shovel and rear-mounted digger. A selection of alternative buckets and other attachments will also be displayed. The 35 semi-industrial tractor will also be shown, with a front-mounted loader and rear-mounted forklift.

THE HEAVY SECTION of the Grimesthorpe foundry of English Steel Corporation, Limited, has increased its casting-pit capacity recently by the addition of two new pits, each 34-ft. long by 18-ft. wide and 10-ft. deep. This brings the total number of casting pits in this part of the foundry up to ten.

F

Ironfounding Health and Safety

Continuing the Report on the Papers and Discussions from the CFA Blackpool Conference

(Continued from page 497)

Care and Maintenance of Grinding Wheels

By W. J. Cleverly

Continuing the proceedings of the Conference on Health & Safety, organized by the Council of Ironfoundry Associations at Blackpool earlier this month, Mr. McCullough's address on the Wednesday evening was followed by a paper entitled "Care and Maintenance of Grinding Wheels" by Mr. W. J. Cleverly (Carborundum Company, Limited). In Mr. Cleverly's absence owing to indisposition, this was read by Mr. Perret, of the same firm, who had spent 37 years in the grinding-wheel industry.

The Chief Inspector of Factories delivered an address entitled "Problems of Industrial Health and Safety," which was reproduced in last week's JOURNAL.

The paper began by quoting Franklin as saying: "A little neglect may breed mischief. For want of a nail a shoe was lost . . . etc., etc.," meaning that such neglect of small things was the basic cause of grinding-wheel breakages, although foundry breakages were less than those of any other industry.

Basically, grinding-wheel breakage arose from four main causes—(1) Lack of appreciation of what a grinding wheel is; (2) ignorance of safety precautions; (3) careless handling, and (4) lack of supervision and maintenance. Under the first heading, it was explained that wheels were of two types, (*a*) vitrified, for running at low speeds and (*b*) resin-bonded for high-speed operation. Type (*a*) was glass-like and subject to shock damage. In type (*b*) could be incorporated a steel ring concentric with the hole as an added safety measure and in any case shock-resistance was much greater than with the vitrified type. Consideration of maximum safe operational speeds was a complex matter and varied with the wheel design. For example, a plain dense wheel was stronger than a cupped wheel. Also maximum operational speed was not always synonymous with maximum cutting efficiency or indeed the speed recommended for a particular purpose. Excessive speed caused shattering of a wheel—a most dangerous occurrence. The spindle speed of a machine should be checked after mounting a new wheel and then the machine run free for one minute, the operator standing at a distance. There was a danger of using vitrified wheels on machines designed for high-speed operation and a risk, too, of failing to alter a belt-drive from the small pulley (in the case of a variable-speed machine) when a new wheel was fitted. With some new designs of grinding machines

The illustration at the head of the page shows Mr. H. J. Bonney, F.C.I.S. (who presided during the whole of the conference), opening the proceedings. On his left is Mr. T. W. McCullough, O.B.E. (HM Chief Inspector of Factories), and on his right, Mr. K. Marshall (director, Joint Iron Council).

this neglect was impossible. It was suggested that a notice of the relevant particular of each machine should be exhibited in the fettling shop.

Other Precautions

Wheels despatched by manufacturers could be cracked in transit to a foundry, hence the need for "ringing" them before fitting, by giving them a light blow when hung freely—a defective wheel would then give a dull sound quite distinct from the sharp ring even of resin-bonded wheels. A cracked wheel should never be mounted and any wheel even suspected of being cracked should be returned to the manufacturer. It was necessary also to select the grit grade and bond of a wheel to suit the grinding job, to adjust the work-rest frequently (not more than $\frac{1}{8}$-in. gap from the wheel was permissible) and to take particular care when trueing and dressing wheels after a period of use. On this latter point, it should be borne in mind that wheels worn out of round could be dangerous, and instruction of operators in the safe and correct use of wheel dressing tools was essential.

The author listed five purposes of wheel guards and discussed the recent official booklet relating to the care of grinding wheels.* Also, on the subject of wheel exposure angles, he described three types, (*a*) those with only a narrow segment exposed; (*b*) those with a wider segment, extending below the horizontal, and (*c*) the case of a snagging wheel, where half the wheel below the horizontal was exposed. In the matter of wheel mounting-flanges, the importance of design and correct diameter was stressed; the use of cast iron for this purpose was vetoed and the use of the maker's centre "wheel-blotter" to assist grip and confer bearing surfaces was explained. For multiple-bolt flanges, the significance of balanced tightening sequence was mentioned and the use of tapered flanges in conjunction with tapered centred wheels (and no blotters) detailed. Also in respect to flanges, the correct and incorrect means of mounting cup- and cone-type grinding wheels were outlined and illustrated.

Cutting-off Wheels

On the subject of cutting-off wheels, the paper described the various types available, saying that these were mainly resin bonded and the 16-in. dia. by $\frac{1}{8}$-in. thick was the most popular size demanded by founders. Precautions to be taken in their use included the avoidance of side pressure and the need to clamp the workpiece; the confidence of the operator in the equipment was important. Reinforced cutting-off wheels were becoming more and more popular, because of the inherently increased safety. The actual reinforcement consisted of layers of fabric and such wheels were especially recommended for use on portable tools.

* "Safety in the Use of Abrasive Wheels," available from H.M. Stationery Office, price 4s.

In the event of a wheel breakage, immediate steps should be taken to inform the manufacturer of the wheel and the machine should be left, together with the broken pieces, as evidence.

Discussion

Mr. H. A. Bonney joined Mr. Perret on the dais to answer questions and referred to his own experience of a 24-in. dia. wheel bursting a month ago. It was a new wheel which had just been run up to speed but the operator was fortunately standing aside and so was unhurt. The cause was an unclean mounting-flange and the use of rubbers instead of "blotters."

Mr. Perret (Carborundum Company, Limited), who deputized for Mr. W. J. Cleverly to give the paper on "Care and Maintenance of Grinding Wheels."

The first speaker stated that in some cases the "booklet" mentioned was at variance with recommendations of grinding-wheel manufacturers and asked which should be followed, with particular reference to the thickness of flanges. The reply was given that the book quoted minimum thicknesses and was a concensus of manufacturers' opinion, but some manufacturers might individually recommend thicker flanges than others. The next questioner stated that wheel guards for portable grinders were difficult to keep on. He wished to use tapered flanges and wheels, but had found these difficult to get from manufacturers. The author replied that tapered flanges were a "must" for use with tapered wheels, but with their adoption some wheel life must be sacrificed. He could not understand the reluctance of manufacturers to supply tapered wheels as it was a 30 to 40-year-old practice to use such designs. The next query dealt with safe storage-conditions for grinding wheels and the questioner was told that wheels were porous and water absorption could cause them to become out of balance. For that reason, a dry atmosphere was essential and the questioner was referred to page 12 of the booklet.

The next point in the discussion dealt with transport precautions which should be taken, and the same questioner also raised the matter of the guarding of wheels and mentioned the danger of hands being caught. Was there a possibility of guarding against this? One representative of a grinding-wheel manufacturer outlined his company's packaging methods and said that in most cases the goods were sent direct to the consumer. Regarding the other point raised, the questioner was told that 100 per cent. guarding of wheels was not practical, but operators could use armoured gloves. The difficulty was to persuade operators to use

One of the corners of the exhibition of safety equipment and protective devices, which was arranged at one end of the Lecture Hall.

gloves, the author added. The employment of the side of the wheel for grinding was always regarded as bad practice and a member of the audience asked why telescopic side-guards could not be incorporated on the machine to prevent this. He was told that some firms painted the side of a wheel. It was difficult to design guards to prevent use of the side of wheels because these would tend to restrict the use of the wheel. A final question concerned reinforced wheels, the questioner asking why all wheels could not be reinforced. He was told that the answer was one of economics; reinforced cutting-off wheels cost about three times the price of ordinary ones—but gave ten times the safety for that particular job! Reinforced wheels had proved to be particularly useful to the non-ferrous foundry industry.

INDUSTRIAL FILM SHOW

Later that evening, there was staged an industrial film show when three films were shown. The first was the new film made by the British Iron and Steel Federation entitled "Hazard." (This was reviewed in the JOURNAL in the February 11 issue.) Although it had no direct reference to foundrywork, the film stressed the need for approaching every job with safety uppermost in one's mind. The film location centred on mountaineering and showed graphically how the safety of every member of a team depended on the care and foresight of perhaps one man. It was not difficult to apply the precepts set out to everyday work in a foundry because the whole theme was the inculcation of safety thinking and safety as a habit rather than a matter of do's and don'ts. The second film shown was entitled "Accidents Don't Happen" and was made by the Canadian Department of Labour. It stressed the danger of complacency and the part which could be played by good-housekeeping. The final film was made by the British Steel Castings Research Association and was called "Let's Clear the Air." This dealt with the research carried out by the Association to eliminate dust from grinding machines, knock-outs and the like.

Cost of Dust

A session on the Thursday morning on the "Cost of Dust" included two papers, by Dr. G. McBain, D.S.C., and Dr. G. F. Keatinge, D.I.H., on pneumoconiosis and its incidence in iron foundries, respectively, and another by Mr. W. B. Parkes assistant development manager, British Cast Iron Research Association) on "How to Control Dust."

(These papers and the joint discussion which followed cannot yet be reported in the JOURNAL because some of the statistics quoted are subject to ratification. They will however be included as soon as possible—Editor.)

(To be continued)

European Apprentice Competition Participants

In the JOURNAL report of the teams selected to represent this country in the European Foundry Apprentice Competition, it was mentioned that two of the team members, as well as the "first reserve," were students of the same College. It is now reported that the third team member has also particular claim to distinction. Employed by Hamworthy Engineering Limited, of Dorset, Mr. T. J. Vincent joined the company as a probationary technical apprentice in August 1956. During the first year of his apprenticeship, he was moved to the foundry division for three months and he found the work so interesting that he asked to be transferred permanently as a foundry apprentice. Since that time, he has worked in all the productive shops at the foundry, both in cast-iron and non-ferrous techniques, and has spent some time working with the foundry metallurgist. Mr. Vincent spends a day each week at the Southampton Technical College where he is taking the specialized foundry-practice course. As a reward for attaining such high marks in the British selection competition to ascertain which boys will enter for the European Competition, the managing director of the firm is arranging for Mr. Vincent to spend six months in the USA to study foundry methods and techniques. The company is taking every possible step to ensure that every assistance is afforded to this young man in an endeavour to bring the European Competition Trophy to this country.

Apart from day-to-day work, Mr. Vincent has many other interests. He was selected to attend a course at the Outward Bound Mountaineering School in 1957, he is a Queen's Scout, scoutmaster of a local troop, a Football League referee and one of Dorset's most successful junior runners.

English Wool Weights of Four Centuries

Special standard weights for use in connection with the important wool industry of England were issued from the reign of Henry VII onwards, and have remained in use until comparatively recent times. They were used by officials called Tronators, who toured the country and whose duty it was to weigh wool and collect the custom or toll, termed Tronage. Though no collector nowadays could hope to get together a long series of these wool weights, they do occasionally crop up in the sale room, and they might occur probably unrecognized for what they are in antique shops.

Founders' Company's Responsibilities

The Founders' Company was responsible for the casting and stamping of these bronze weights, which were issued in two sizes, 7 lb. and 14 lb. (see Fig. 1). The Company was empowered by law to charge fees for stamping the weights, and was also authorized to exact heavy penalties from anyone who issued a weight without the Company's verification marks. Sets of standard weights, which included the 7-lb. and 14-lb. wool weights, were issued by an Act of 1494 to 43 towns in England, the number of towns being increased in 1588 to 58, when 11 of the principal towns in Wales were included for the first time. On the occasion of the issue of new sets of standard weights the old sets were recalled, and heavy penalties were imposed for failure to return them.

Wool weights were cast in bronze and shaped in the general pattern of the outline of a shield, the 7-lb. weight being about 6 by 4 in., and 1¼ in. thick. The face of the weight is taken up almost entirely by a relief of the Royal Arms, but a margin is left all round on which will be found various small impressed marks. These are the verification marks impressed by the Founders' Company, the chief of which takes the form of a ewer used by the Company as a mark from early Tudor times and the central feature of its coat of arms, granted in 1590. This mark is accompanied by an avoirdupois A (a capital A with a horizontal line on the apex), a dagger and the Royal cipher, some of these marks being impressed in duplicate or even triplicate.

Weight Adjustment

Other marks may indicate the city or county to which the weight belonged, and normally take the form of a capital letter sometimes accompanied by the city or county emblem. The reverse of the weight usually has a hollow: any adjustment required to the weight on its being retested was made either by removing metal from the cavity or by adding metal to it, according to whether it was overweight or underweight. Occasionally the back surface is quite flat, but this is not common. Weights were issued in pairs, and have in the top edge a square or oblong hole through which a leather strap was passed to connect the two weights. Some specimens have a circular hole, in which case the strap was attached to a metal ring which passed through the hole.

(Courtesy: Victoria and Albert Museum.)

A 7-lb. wool weight bearing the Arms of George I.

It would appear that no wool weights were cast after the reign of George III. The importance of the wool industry was then beginning to decline, and returned wool weights were restamped after any necessary weight adjustment with the cipher of the reigning monarch, sometimes accompanied by a date. An example of such practice may be seen on a weight in the Northampton Museum issued in the time of George I, and bearing subsequent verification marks of William IV with the date 1826.

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Latest Foundry Statistics

Steel Castings: A steady increase in the production of steel castings is shown in the figures published in the Monthly Statistics *Bulletin* of the Iron and Steel Board and the British Iron and Steel Federation. The estimated total of 6,000 tons produced in February is 300 tons more than the January output, and 1,000 tons more than in February, 1959.

Ironfounding: It is reported by the Council of Ironfoundry Associations that the number employed in the ironfounding industry during the week ending February 27 was 129,012, an increase of 613 over the previous month. The total for the similar period in February, 1959, was 125,022.

SCOW's Record Production

A record total of 1,350,000 tons of ingot steel was produced by the Steel Company of Wales, Limited, in the six months to the end of March. The total for the previous six months was 1,295,000 tons. A statement issued by the company last week says that the target of 3,000,000 tons a year—the aim of the present development plan—should be reached before the end of this year. Current rate of annual production is given as 2,850,000 tons.

During the half-year there were substantial increases in production of the company's main products. Output of sheets rose from 513,000 tons in the six months ended last September to 542,000 and tinplate output increased to 454,000 (394,000) tons. Production of plates for the shipbuilding industry, however, was reduced from 122,000 tons to 89,000, leaving room for part of the increase in production of the sheet and tinplate for which its plant is mainly intended. Coke production rose from 544,000 tons to 712,000 tons and pig-iron output was increased from 726,000 tons to 963,000 tons.

Work is on schedule for the £20,000,000 fourth development plan, which is designed to raise ingot production to 3,600,000 tons a year and to give an extra 400,000 tons of sheet and tinplate annually when completed late next year or early in 1962.

Contracts worth about two-thirds of the total scheme have already been placed. Most of the individual items, however, form a relatively small part of the whole, since the main purpose of the scheme is to make the current plant more productive. The continuous casting plant is the most important single new item in the project.

The directors intend to issue a statement of profit for the half-year to March, 1960, following the board meeting on June 9.

Cast-iron Bollards

Artillery Lane, Bishopsgate, London, got its name from the fact that it was the practice ground of the City Trained Bands, which were England's first volunteer military force, established in 1585 because of the threatened invasion of the Spanish Armada. The cast-iron bollards (shown in the accompanying illustration) which close the lane to all but pedestrian traffic, were probably made from old patterns for cannon.

New Patents

(Copies of complete specifications are obtainable from the Patent Office, Sales Branch, 25, Southampton Buildings, Chancery Lane, London, W.C.2, price 3s. 6d.)

813,064. Schueler Automatic Foundry Processes, Limited, The Old College Works, Tideswell, near Buxton, Derbys.

This invention relates to a process and apparatus for the production of such articles as hollow sand cores, adapted to be made from an intimate mixture of sand (or other finely divided material) and a thermosetting resin. (The invention is an improvement on this company's previous patent No. 735,355, FOUNDRY TRADE JOURNAL, September 8, 1955.)

813,232. Hans Joachim Fuchs, Otto Fuchs, K.G., Meinerzhagen, Westfalia, Germany.

A method of producing castings by injection moulding; and die-casting machines and apparatus for carrying out this method.

813,275. Power Jets (Research and Development), Limited, 25, Green Street, London, W.1.

The coring of holes in castings. It is particularly, but not exclusively, applicable to precision castings made by the lost-wax (or similar) process in which an expendable pattern is invested in a mass of refractory material and subsequently melted or otherwise destroyed to leave a cavity. (See also B.P. 710,334.) This present invention claims the use of cores formed of a material which can be oxidized out, while the casting is very substantially unaffected. This avoids previous methods of dissolving the core out with caustic soda with its accompanying industrial hazards.

813,382. E.M.B. Company, Limited, Moor Street, West Bromwich, Staffs.

Control means for metal die-casting machines, for automatically governing the rate of retraction of the movable die from the moulding position.

813,504. Fairey Aviation Company, Limited, North Hyde Road, Hayes, Mddx.

According to this invention, a method of producing an investment-casting mould includes the step of coating a pattern with a slurry including between 15 and 100 per cent. silica. (See also B.P. 767,114, FOUNDRY TRADE JOURNAL, March 14, 1957.)

Brown Bayley's Order-book

Although starting the year with a scarcity of orders associated with the recession in the general engineering industry, Brown Bayley Steels, Limited, of Sheffield, a subsidiary of Brown Bayley, Limited, showed a substantial improvement and by the end of the year the order-book was healthy, reports Mr. J. W. Garton, chairman of both companies.

Another subsidiary, the Hoffmann Manufacturing Company, Limited, achieved a record turnover, which resulted from the marked improvement in the order position from the middle of the year onwards. Mr. Garton states that the company's prosperity is a reflection of the activity of the country's engineering trade as a whole since its own trade is broadly based.

Group net profits of Brown Bayley Steels were £378,549, compared with £328,959, to which is added a subsidiary dividend from profits of earlier years of £9,386 (£285 retained). The dividend is increased from 11 per cent. to 13¾ per cent. Hoffmann Manufacturing distribution is maintained at 36 per cent. for the year. A one-for-one scrip issue is also proposed.

Iron and Steel Merchants's Annual General Meeting

The National Federation of Iron and Steel Merchants welcomed as its guests, Mr. Richard F. Summers, president of the British Iron and Steel Federation and chairman of John Summers & Sons, Limited, and Mr. L. C. Salter, sales director of that company, to a luncheon which preceded the annual general meeting of the Federation, held at the Dorchester Hotel, London, on April 21. Before reviewing the events of the year, the independent chairman, Mr. W. H. Lawson, referred to the death of Mr. John Findlay, a member of Council for many years, and also to the retirement of Mr. F. Arnold Wilson, another long-standing member of Council of the Federation.

In his report, Mr. Lawson said that during the year there had been throughout the world a steady recovery in the demand for steel. Output in the United Kingdom had been about 5 per cent. higher than in the previous year, and in the last quarter of 1959, the industry had been working at about 93 per cent. capacity. According to the Iron and Steel Board, additional capacity would be put into operation during 1960, raising total capacity to about 25,000,000 tons. Estimated output had been put at about 24,000,000 tons. A recent development of interest had been the reduction of maximum prices of some iron and steel products.

As to exports, Mr. Lawson reported that the tonnage of steel exported from the United Kingdom during 1959 had shown an increase over the previous year, the USA strike being an exceptionally significant factor. Other matters referred to by the chairman were the suspension of import duties on certain steel products, trade missions, and the Restrictive Practices Act. He also announced that this year's tenth annual meeting and congress of the International Federation would be held in Amsterdam.

(Considering the above report, it should be borne in mind that the demand for castings often goes hand-in-hand with the demand for steel, and trends on the steel side are often pointers to what may happen in the foundry world—Editor.)

British Standards Institution

The British Standards Institution announces the issue of two further revised parts—9 and 15—of B.S. 1016, "Methods for the analysis and testing of coal and coke." In part 9, "Phosphorus in coal and coke," which deals with the determination of this element in the fuel ash, a volumetric method, similar to that in B.S. 1016:1942, is specified and details of a colorimetric method have been added. The procedure for testing the fusibility of coal ash and coke ash is closely defined in part 15. Three characteristic temperatures are specified: (*a*) when the first sign of fusion is visible, (*b*) when the test-piece takes the form of a hemisphere, and (*c*) when the hemisphere has melted down to one-third of its height. The determination is carried out in either an oxidizing (carbon-dioxide or air) or a reducing (equal volumes of carbon dioxide and hydrogen) atmosphere and any departure from the characteristic deformation pattern is noted. The German standard method, using a Leitz heating microscope, is briefly described in an appendix.

Copies of this Standard may be obtained from the sales branch of the Institution, 2, Park Street, London, W.1: price 4s. 6d. (postage extra to non-subscribers).

Kelvin Hughes/Curtiss-Wright Agreement

An agreement has been concluded between the UK Kelvin & Hughes group and the American Curtiss-Wright Corporation for the exclusive rights to manufacture and sell the non-destructive testing equipment of the other partner. This includes instruments for the inspection and measurement of materials, and equipment employing ultrasonic techniques in all industrial fields.

Kelvin & Hughes has developed a range of manual, semi-automatic and automatic ultrasonic test equipment. Curtiss-Wright also manufactures ultrasonic equipment but has, in addition, a range of industrial radiographical equipment using X-ray and gamma-ray techniques. The immediate advantages of the new partnership will be that both organizations will have more models of non-destructive equipment available. Under the agreement, there will be no duplication of research and, as a result, future progress in this field will be greatly speeded up.

The Kelvin & Hughes range of indicating temperature controllers, dynamic strain recording equipment, non-destructive testing equipment, etc., will be on show on the stand of the company's industrial division at the International Trade Fair to be held at Poznan, Poland, from June 11 to 25.

Institute of Clay Ceramics

The Sheffield branch of the Institute of Clay Ceramics held its annual dinner at the Rising Sun Hotel, Bamford, Derbyshire, on April 22, when over 100 members and guests were present.

Mr. G. H. Stewart, secretary of the Institute of Ceramics, replying to a toast to the guests, proposed by Mr. P. F. Young, Sheffield branch chairman, said that the ceramics industry in this country and elsewhere, needed to become increasingly aware that it was a sub-industry and part of a greater whole. He added that the British Ceramics Society had recently formed a basic science section on an equal footing with the three existing sections—pottery, refractories and building materials.

Other speakers were Dr. J. H. Chesters, assistant director, research and development department, United Steel Companies, Limited, and Mr. A. Marshall, of Sheffield, the national president of the Institute of Clay Technology. The guests included Professor James White, Sheffield University, president of the Refractories Association, Dr. C. Booth, research department of the Steetley Company, Limited, Worksop, and Dr. N. F. Astbury, director of research of the British Ceramic Research Association.

Raw Material Prices continue to fall

Price fall of raw materials continued in March with the provisional index for materials and fuel used in manufacturing industry standing at 0.8 per cent. lower than the previous month. Among the decreases was the price of copper which, after showing an upward movement for some months, dropped by 4 per cent. The provisional index for home market sales of all manufactured products rose by 0.1 per cent.

A NEW research and development building, covering some 4,000 sq. ft. and consisting of a development shop, laboratory, instrument shop and drawing office, has been completed by Cochran & Company, Annan, Limited, at their Newbie Works in Dumfriesshire.

Notes from the Branches

Slough Section

On Tuesday, March 29, the Slough section of the Institute of British Foundrymen concluded the 1959/60 technical sessions with their annual general meeting, which was held in the Lecture Theatre, High Duty Alloys, Limited, Slough. Mr. S. J. Williams, the section president, was in the chair. At the election of officers for the 1960/61 session, Mr. H. J. Proffitt was made president; Mr. L. Elliott, senior vice-president, and Mr. R. J. Bown re-elected as secretary. The domestic business of the section took only a short period of the meeting, after which the main business followed. This was a lecture entitled "The New Metals" that was given by Mrs. M. K. McQuillan of Imperial Chemical Industries, Limited (Metals Division). The choice of subject, whilst being metallurgical, was not exactly a foundry subject, nevertheless it proved to be of great interest to all the members present.

Mrs. McQuillan, the section's first lady lecturer, commenced by explaining exactly what the "new metals" are, and why they are called new when in fact they have been known to the chemist for a very considerable time. These metals, she explained, are extremely difficult to extract from their ores in a sufficiently pure and ductile form, and there was really no need for their use in engineering until such developments as the gas turbine and the nuclear reactor came into being—it was then that sufficient incentive (and money) was provided to overcome the very difficult problems in producing them.

Characteristics

The characteristics demanded by modern developments were given as follow—high strength at high temperature (for gas-turbine engines)—and reasonable strength at moderately elevated temperatures combined with good resistance to corrosion in steam or carbon dioxide, plus specific nuclear properties (for nuclear reactors, and to a certain extent in the chemical and electrical industries where corrosion resistance or unusual electrical properties in the oxide film formed at room temperatures were needed). Mrs. McQuillan then gave the group of metals in which all these characteristics can be found, titanium, zirconium, hafnium, vanadium, indrium, tantalum, chromium, molybdenum, tungsten and beryllium, but she explained that these are not without attendant disadvantages, therefore the development of these metals is a matter of exploiting their advantages and of overcoming their disadvantages, a process which she was quick to add, is still in its fairly early stages.

After a general survey, she selected metals individually and explained the advantages and disadvantages in each field of use, explaining how far and to what extent research and development had taken place, and for what uses the particular metals could be and were being used. Mrs. McQuillan then devoted a considerable amount of time to explaining the very complex and dangerous problems faced when it came to melting the "new metals" industrially. The greatest difference between the new metals and the common metals comes from their habit of reacting violently with air, and with all refractory materials, in the liquid state. Not only has air to be excluded during melting, but the liquid metal must not come into contact with any of the traditional crucible materials, moreover the high-melting points of these metals raise the liquid metal temperature to very high levels. Mrs. McQuillan said that although at first these considerations appeared to impose almost insuperable difficulties, they have now, with the industrial development of titanium, been completely overcome by the adaption of laboratory techniques to industrial-scale melting problems, and methods established have since been used for other new metals with relatively little modification.

Methods of Melting

The melting methods now in use were explained in very great detail by the author. The key to the melting of "new metals," she said, proved to be the cold-crucible arc-melting technique and Mrs. McQuillan followed the development of this through from 1893 until the present day. She explained, however, that disadvantages of the arc-melting process were found when purification is to be combined with melting of such metals as niobium, tantalum and vanadium, and for these metals a new technique has been developed, *i.e.*, electron-beam melting; this she explained avoided the fundamental difficulties of arc-melting from the purification point of view.

Safety hazards are a very big problem to those concerned with melting these metals and Mrs. McQuillan spent quite a little time on explaining the elaborate precautions necessary to safeguard all concerned.

The lecture concluded with a description of the work done to date in the casting of these new metals. Mrs. McQuillan explained that these metals must be considered fundamentally unsuited to casting, but said that some attempts have, however, been made to overcome the many difficulties, and small castings in titanium and zirconium can be produced. Slides were shown of small castings and the type of moulds (graphite) used to produce these. Finally Mrs. McQuillan said it was felt that interest in the melting of the newer new metals will be confined to refining and ingot production for some time to come.

The lecture was excellent, but the way Mrs. McQuillan answered the many questions following was even better; if anyone feels that metallurgy is a man's domain they should listen to Mrs. McQuillan and will doubtless feel chastened for having such a restricted outlook. Mr. H. Proffitt in proposing the vote of thanks to Mrs. McQuillan for her lecture was full of enthusiasm at the way she had put over her subject, he was also very pleased to be able to thank Slough's first lady lecturer for such an interesting and well informed paper. Mr. Hoesli who seconded the vote of thanks was very pleased to echo Mr. Proffitt's feelings towards such an interesting lecturer.

Distington's First Continuous-casting Plant

The new four-strand continuous-casting plant which Distington Engineering Company, Limited, are to build and instal at Appleby-Frodingham Steel Company, Scunthorpe, will have the largest productive capacity in the world for a machine of its type. Equipped to cast four strands of blooms 9-in. square, the machine will be designed to operate from 100-ton ladles of steel, with a weekly production capacity of 5,000 tons. It is scheduled to begin operations in December, 1961. Liquid steel will be poured from the ladle into a common tundish, with four stopper-controlled nozzles feeding direct into the copper moulds. Below, after leaving the spray-cooling chamber, the solidified blooms—withdrawn through pairs of withdrawal rolls—will be cut off vertically into 30-ft. lengths.

ON THURSDAY, April 21, the senior management of Kent Alloys, Limited, played the company's netball team. The final score was in favour of the ladies, but an enjoyable game was had by all.

News in Brief

AN ORDER for £1,250,000 worth of Caterpillar D8H tractors, fitted with hydraulic bulldozers, has been placed by the *Institute Nacional De Reforms Agraria* of Havana with Bowmaker (Plant), Limited, of Willenhall.

EMPLOYEES in Hungary's foundry and machine industry are to share 318 million forints (nearly £10,000,000) in the industry's annual distribution of surplus profits. The amount paid to each employee will average 16.8 days' extra pay.

NICKEL/ALUMINIUM-BRONZE propellers and castings made from a new gunmetal alloy will be amongst the exhibits at an exhibition which the Mond Nickel Company, Limited, is organizing to take place at Moore's Hotel, Glasgow, from May 3 to 6.

THE HANDLING AND MARKETING of all articles for industrial consumption manufactured by the Fleming/B.A.O. group of companies is now being dealt with through a new subsidiary, Optoshield, Limited. Mr. C. J. Williams has been appointed general sales manager of the new company.

NEW COMPANY to provide a hire service in mechanical-handling plant and other products of Richard Sutcliffe, Limited, manufacturers of mining machinery and mechanical-handling equipment, etc., of Wakefield, has been formed. The ninth company in the Sutcliffe group, it will be known as Plant Hire, Limited.

VAUXHALL MOTORS, LIMITED, reveal that during 1959 they spent £1,794,000 on production materials from companies in Scotland, and that these supplies made a significant contribution to Vauxhall exports. During the year the company bought materials from nearly 600 firms in 39 counties in Britain.

CLAYTON DEWANDRE COMPANY, LIMITED, Lincoln, have secured a long lease of a factory in Southampton in order to cope with increased demand and to assist in the production of a new power-assisted braking device. A new subsidiary company, Power Brakes, Limited, has been formed to deal with the capital investment being made in Southampton.

IT IS REGRETTED that in reporting the list of recipients of long-service awards at Dilworth & Carr, Limited, in the April 7 issue of the JOURNAL, Mr. R. Guymer was said to be a director of United Glass, Limited, the parent organization. In fact he is a director of Dilworth & Carr, and his position with United Glass is that of sales administrator.

PRODUCTION of 1 lb. of scandium, an extremely rare metal, by Union Carbide International Company, USA, marks the first time that such a "large" quantity of scandium ever existed in one place at one time. The material is in the form of two discs of scandium about 3½-in. dia. and ½-in. thick. Scandium has a density comparable to aluminium, but a relatively high melting point of 1,550 deg. C.

FIFTY-ONE DRIVERS employed by Thos. Firth & John Brown, Limited, Sheffield, were recently presented with safe-driving awards by Alderman A. V. Wolstenholme, Lord Mayor of Sheffield, and a sales representative of the firm. Mr. George W. Gregory, aged 59, who has been with the company for 42 years, received a second bar to his 30-year brooch. In 12 months the drivers had covered 201,000 miles carrying loads weighing a total of 692,760 tons.

A NEW COMPANY in Africa has been announced by Leyland Motors, Limited, to cover the territories of Kenya, Uganda and Tanganyika. It will also handle sales and service in Somalia, and will shortly appoint a concessionaire in Mogadiscio. The company will trade under the title of Leyland Albion (East Africa), Limited, with its head office and works in Nairobi. Directors of the company are Sir Henry Spurrier and Mr. J. L. Blackwood Murray, Leyland's resident director in Southern Africa.

Mr. R. P. WALLACE, managing director, Jessop-Saville, Limited, Sheffield, presided at the annual dinner of the firm's Brightside Works Ambulance Corps on April 22, and Mrs. Wallace presented the prizes. Mr. H. Ebbins received the Coppel Cup, the men's individual first prize, and Mrs. M. Unwin, the women's first prize. About 50 members received prizes. Mr. J. G. Bailes, the corps president, presented Mr. H. Duncan, corps secretary and instructor, and Mr. F. Swift, with 25-year service medals. Mr. C. Whitaker, deputy works director, said in many accidents, the individual was at fault.

TO PRESENT their latest products to British industry, the following firms have combined to stage exhibitions of industrial equipment and services in various parts of the country:—Commando Industrial Services, Limited; Firth Cleveland Tools, Limited (Surform division); Hughes-Johnson Stampings, Limited; Light-Metal Forgings, Limited; Industrial Fan and Heater Company, Limited; G. E. Simm Engineering, Limited; Tirfor, Limited; Charles Smith & Son (Woodcraft), Limited, and West Instrument, Limited. Details are available from Mr. W. G. Appleyard, 71, Broad Street, Birmingham, 15.

THAT CUPOLETTES IN FOUNDRIES are apt to cause a sufficient volume of dust and grit to warrant a visit from the local authorities is evident from the case, reported in the Council of Ironfoundry Associations' April *Bulletin*, of the iron foundry in the Birmingham district which was recently fined £10 because of this particular nuisance. Although cupolettes may present special problems in regard to the choice of suitable plant for arresting dust and grit, the CFA advises ironfounders who operate this type of plant to make sure they are taking the necessary precautions as required by the Clean Air Act.

INSISTENCE ON QUALITY FIRST is the reason for the success of the Alfred Herbert organization under the difficult conditions prevailing in the machine-tool industry, says Colonel C. W. Clark, chairman, in his annual review. He states that the group's stocks are lower than they were and there is a growing backlog of orders for certain types and sizes of machine-tools. There is a sound export business, despite licence frustrations, and there are no signs that the group's European trade is in any danger. When the new research and development section of the works is fully equipped, it will be "quite exceptional in the scope of its activities."

"THE SECOND APPRENTICESHIP" was the title of a talk by Sir Harold West, former managing director of Newton Chambers & Company, Limited, Chapeltown, to Sheffield Rotary Club on April 11. Sir Harold, a former Master Cutler and former president of Sheffield Chamber of Commerce, appealed to retired Sheffield industrial leaders to devote some of their retirement time to the work of assisting in training youth leaders. He said that a man with experience of industrial leadership could give enormous help and encouragement to the youth services of the city. "The businessman who retired simply to a life of ease and leisure was merely allowing himself to grow old on the 'more waste, less speed' principle," said Sir Harold.

News in Brief

DAVY AND UNITED ENGINEERING, LIMITED, Darnall, Sheffield, have formed a new steel-processes division to take over the work and staff of Davy British Oxygen. Just over three years ago the relevant interests of Davy and United and British Oxygen were amalgamated to investigate the various kinds of pneumatic steel-making processes. Research has also been conducted into oxygen steelmaking plants. Now it has been agreed that the execution of prospective contracts for oxygen steel-melting shops should be handled by Davy United in view of their experience in heavy steelworks. The new division will be at Suffolk House, Sheffield 2. The original joint company will be kept in existence in order to provide the means for future development.

THE NATIONAL INSURANCE ADVISORY COMMITTEE announces that details of the arrangements made for the collection of graduated pension contributions by the Inland Revenue through the PAYE system, including the returns to be made by employers, have now been published in the "Draft National Insurance (Collection of Graduated Contributions) Regulations, 1960," pamphlet which is now obtainable from H.M. Stationery Office, York House, Kingsway, London, W.C.2, price 6d. The draft regulations make the procedure for the collection of graduated contributions correspond with PAYE tax procedure so that the existing PAYE system can be used for both tax and graduated contributions. The latter contributions are due to begin next April.

THERE IS AN ALERT to users of wolfram ore in Sheffield and elsewhere that seven tons of the ore, valued at £4,000, were stolen from the premises of a road-haulage firm in London over the Easter holidays. The ore was packed in 140 bags and belonged to Derby & Company, Limited, ore suppliers. It was loaded on a lorry ready for delivery to the north and locked in a warehouse. Men returning from the Easter break found they could not enter the warehouse because the padlocks had been changed. When they got in, they found the lorry had gone, it was later found empty at St. Pancras. About a dozen firms in the country use the wolfram for making tungsten. Half of these are in Sheffield. It is an unusual robbery insofar as the market for the ore is extremely limited. There are only five firms in the country which normally supply the ore.

FIRTH-VICKERS STAINLESS STEELS, LIMITED, Sheffield, celebrated their 25th anniversary on April 7 by entertaining 250 guests from overseas and Britain, who toured the firm's works and lunched together afterwards. Dr. Charles Sykes, chairman of the company, told guests at the luncheon that stainless steel was an attractive business to be in because the forecasted demand for stainless-steel products doubled every ten years. This rate of growth, however, could only be sustained by energetic research development and sales promotion. Surveying the history of the firm, Dr. Sykes said this showed continuous expansion. The company's deliveries in the first year of operation, in 1935, were just below 6,000 tons and the employment roll was 1,400. Now there was a manufacturing capacity of 40,000 tons per year, and there were 4,200 workers.

THE BIGGEST SALES DEMONSTRATION ever sponsored by a British firm in America was recently staged at Phœnix, Arizona. The object of the "Tillerama," as it was called, was to launch in America the products of Landmaster, Limited, the member of the Firth Cleveland group which manufactures agricultural and horticultural machinery based on rotary tilling. Four parties, totalling 150, of America's most influential farm-equipment distributors and wholesalers and agricultural writers were invited to spend two nights at the Westward Ho Hotel in Phœnix, as guests of Landmaster. One hundred and forty nine accepted. Three types of Landmaster machine, the tractor-mounted rotary-tillers, the Mark 150 and the Mark 80 cultivators were demonstrated with all their attachments. After a three-hour show ample time was allotted to inspection and practical tests by the visitors.

IT IS REPORTED that over a dozen leading foundries in the Philadelphia area will hold "Open House" for the thousands of foundrymen who will be attending the Castings Congress and Exposition to be held from May 9 to 13. Amongst these are Link Belt's Olney Foundry, Northern Bronze Corporation, Kitson valve division of Welsback Corporation, and Wilkening Manufacturing Company. Other foundries in the immediate Philadelphia area include Atlantic Steel Castings Company, Alan Wood Steel Company, Birdsboro Steel Foundry & Machine, Lehigh Foundries Company, and the Wyomissing plant of Textile Machine Works. New Jersey and Deleware foundries which will conduct open house during the week of the Exhibition include Eastern Malleable Iron Company, of Wilmington, Delaware; Florence Pipe Foundry & Machine Company, Florence, New Jersey; US Pipe & Foundry Company, Burlington, New Jersey; and Universal-Rundle Corporation, Camden, New Jersey.

MR. J. S. MACLAY, Secretary of State for Scotland, has told Greenock Town Council that he would be willing to approve, in principle, the erection of three or four small factory units in advance of specific request from industrialists. Mr. Maclay in a letter said that most firms prefer to have a building designed to suit their precise requirements rather than something built to a standard pattern. He recognizes, on the other hand, the value of small units of about 2,000 sq. ft. to allow industrialists to try out the project on a small scale. In view of this, and of the possibility that the redevelopment of the Burgh might displace some industrial undertaking for which alternative premises ought to be made available, he would be willing to approve, in principle, the erection of three or four units of the kind stated under the Town and Country Planning Act. This, however, would be regarded as an experiment, and no specific grant would be available to the Town Council for this purpose.

Obituary

MR. WALTER FREDERICK HALL, M.B.E., formerly chief supervisor of the accountancy department at Rolls-Royce Limited, Derby, until his retirement in December, 1955, after 41 years' service with the firm, has died at the age of 70.

MR. ERNEST GILLESPIE, an industrial architect with the International Harvester Company for 44 years, died on April 8 at the age of 81. He had worked for the Harvester Company in France and Belgium and made his home in England shortly after the outbreak of the second world war.

The death is announced of MR. J. H. DOLPHIN who had been the representative for the Pattern Equipment Company (Leicester), Limited, since 1958. He was 59. Previously he had held appointments as foundry manager in Birmingham and Sheffield. He was a member of the Birmingham branch of the Institute of British Foundrymen and a Fellow of the Institution of Metallurgists.

"To Be or Not to Be"

The attributes of "foundrymen of the future" and what foundrywork offers to men of the future are perenially conjectured among founders of to-day. Quite recently an inquiry from apprentices already within the industry asked if they, as craftsmen ultimately, would have any place at all in to-morrow's set-up. In trying to answer some of these problems, Mr. T. D. Oughton included the following remarks in an address to the East Anglian section of the Institute of British Foundrymen:

Where will the foundryman stand in the future? Will he still be needed, or will he become obsolete in the totally-mechanized foundry, to be replaced by someone who merely stands by to press a button at appropriate times. Melting and making castings is neither an art nor a pure science, a bit of both are required and, as long as this is so, foundrymen are going to be needed.

Fundamentally, mechanization, automation or whatever one likes to call it, does not alter the problems of pouring metal into holes in sand to make castings. Generally, it only increases the frequency in which problems occur, and brings them out in a new disguise. All these problems are as old as the history of casting metals, but the approach to them must vary with new techniques.

A Bishop once visited one of the early smelting furnaces in the days when the Devil and magic were believed to have even more say in foundrywork than they have to-day. When the furnace was tapped one of the iron workers who was tired and hot "became exasperated and, using wild words, swore lustily." Thereupon the metal froze in the furnace and it was not until the Bishop was persuaded to come again the next morning to bless the furnace, that the metal started to flow again.

Yet to-day, founders get the same trouble with their furnaces, but in the interim period they have learned to use the oxygen lance—though it is not unknown for foundrymen to appeal for divine assistance on other problems! Look what mechanization has meant. More unskilled or semi-skilled men are employed, and the skilled operator has been largely replaced by men with technical knowledge backed by practical experience. The foundryman of the future will probably have to be more of a specialist than has been the case in the past, and he will have to be sufficient of an engineer to know and understand the machines he works with in order to get the best out of them. He will also have to be better trained and know more about the theory of foundry practice than his predecessors, and, although a specialist in his own field, he will have to have a wider knowledge of metallurgy and founding in general.

TWO GAS-WASHING ATTENDANTS at the Cargo Fleet Works, Middlesborough, of the South Durham Steel & Iron Company, Limited, were taken to hospital on April 24 after being overcome by gas during the process of washing blast-furnace gas.

WHEN the ninth Electrical Engineers Exhibition closed at Earls Court on April 9 the total attendance figure was 75,962—over 10 per cent. more than in 1959 (68,352). Overseas visitors from 76 countries numbered 886. 464 exhibitors showed their products at the 1960 Exhibition and all the figures quoted here broke the previous record. The tenth Electrical Engineers Exhibition will be held at Earls Court from March 21 to March 25, 1961, inclusive.

ISI Translations

It is announced in the latest list of translations from the Iron and Steel Institute, 4, Grosvenor Gardens, London, S.W.1, that the following translation is now in course of preparation:—

1692 "MATERIALS WITH HIGH STRENGTH AT ELEVATED TEMPERATURES FOR PRECISION INVESTMENT CASTINGS." R. Schwalbe, *Stahl u. Eisen*, 1960, Jan., pp. 36-45.

In the following list the initials DSIR, etc., stand for the organization to which enquiries should be made, quoting the reference numbers.

BCIRA 1 "BEHAVIOUR OF CAST IRON UNDER SLOW LEAD ALTERNATIONS." Berliner, S. *Ann. der Physik*, Series 4, 1906, vol. 20, pp. 527-62.

DSIR M. 1136 "CAUSES OF PREMATURE FAILURE OF REFRACTORY WALLS AND ARCHES IN LOCOMOTIVE FURNACES." Budnikov, P. P., and M. A. Matveev. *Ogneupory*, 1946, *11* (6), p. 23.

BCIRA 10 "INTERNAL STRESSES IN CAST IRON." Buhler, H., and Schepp, W. *Gies. Tech. Wiss*, 1959, No. 25, July, pp. 1395-1401.

BCIRA 12 "EXPERIMENT AT THE RENAULT WORKS IN THE FIELD OF CORE-MAKING IN HOT BOXES." Jasson, P. *Fonderie*, 1959, No. 164, Sept., pp. 395-407.

DSIR M. 1133 "DETERMINATION OF REHEAT SHRINKAGE AND EXPANSION OF REFRACTORIES." Keler, E. K. *Ogneupory*, 1946, *11* (7/8), p. 23.

DSIR M. 1134 "UNIVERSAL APPARATUS FOR THE MEASUREMENT OF DEFORMATION AT HIGH TEMPERATURES." Keler, E. K. *Ogneupory*, 1938, *6*, p. 1284.

DSIR M. 1135 "TESTING OF REFRACTORY MATERIALS IN TORSION." Keler, E. K. *Ogneupory*, 1946, *11* (3), p. 31.

DSIR M. 1131 "FIRING CLAY TO GROG IN A ROTARY KILN." Kogan, E. A. *Ogneupory*, 1945 (1), p. 21.

DSIR M. 1119 "MOULDING HIGH-DUTY METALLURGICAL AND COMPLICATED COKE-OVEN SILICA BRICKS BY THE METHOD OF HIGH-FREQUENCY VIBRATION." Kukdev, G. *et al. Ogneupory*, 1957, *5*, p. 510.

DSIR M. 1137 "CONSUMPTION OF BASIC REFRACTORIES IN OPEN-HEARTH FURNACES." Luri, M. A. *Ogneupory*, 1947, *12*, p. 261.

BCIRA 2 "GASES IN CAST IRON." Marincek, B., and H. Feichtinger. Proceedings of the 25th International Foundry Congress, Liege, 1958, pp. 66-82.

DSIR M. 1129 "METHODS OF TESTING THE CONSISTENCY OF REFRACTORY MORTARS AND COATINGS." Matveev, R. R. *Ogneupory*, 1941, *9*, p. 110.

BCIRA 7 "THE FORMATION OF SPHEROIDAL-GRAPHITE AND PROGRESS IN HIGH-TENSILE-IRON TECHNOLOGY." Milman, B. S. *Lit. Proizv.*, 1958, No. 6, June, pp. 11-17.

BCIRA 13 "CRYSTALLIZATION OF FLAKE IRON-GRAPHITE EUTECTIC IN GREY IRON." Patterson, W., and D. Ammann. *Gies. Tech. Wiss*, 1959, No. 23, Jan., pp. 1247-1275.

BCIRA 14 "ATTEMPTS AT INTERPRETING THE EFFECT OF INOCULATION ON CAST IRON." Patterson, W., and E. von Gumpert. *Gies. Tech. Wiss.*, 1959, No. 25, July, pp. 1341-1361.

DSIR M. 1125 "PRODUCTION OF LIGHTWEIGHT REFRACTORIES AND SUPER REFRACTORIES BY THE FROTHING METHOD." Pirogov, A. A. *Ogneupory*, ½, p. 260.

DSIR M. 1126 "SEMI-PRODUCTION TRIALS ON THE MANUFACTURE OF INSULATING REFRACTORIES BY THE FROTHING METHOD." Pirogov, A. A. *et al. Ogneupory*, 1937, *5*, p. 100.

DSIR M. 1121 "PRODUCTION OF 'FROTHED-GROGGED' HEAT INSULATING BRICKS AT THE PODOL WORKS." Pirogov, A. A., and L. R. Bilson. *Ogneupory*, 1938, *6*, p. 1286.

DSIR M. 1106 "COATINGS FOR LIGHTWEIGHT REFRACTORIES." Pirogov, A. A., and A. Ya. Roizen. *Ogneupory*, 1940, *8*, p. 560.

BCIRA 11 "GRAPHITE CRYSTALLIZATION IN IRON-CARBON ALLOYS." Czikel, J. *Gies. Tech. Wiss*, 1959, No. 25, July, pp. 1395-1401.

Symbols for sources of translations:—

DSIR: Department of Scientific and Industrial Research, 20, Chester Terrace, London, N.W.1.
BCIRA: British Cast Iron Research Association, Bordesley Hall, Alvechurch, Birmingham.

The Institute announces that a list of Russian scientific and technical journals available in English may be obtained from the specialized information section OEEC/EPA, 3, rue Andre Pascal, Paris 16, France, giving all relevant information except details of up-to-dateness.

Personal

Mr. BERNARD DIXON has been elected a director of G. Hopkins & Sons, Limited, engineers, United House, London, N.7.

Mr. K. M. EATON, general supply manager of Vauxhall Motors, Limited, has been elected a director of the company.

Mr. ERIC B. CARTER, formerly of Halifax, Yorkshire, has been appointed director of engine production under the Ministry of Aviation.

Mr. IAN A. HEATH has been elected a director of Samuel Heath & Sons, Limited, general brassfounders, Cobden Works, Birmingham.

Mr. L. H. POMEROY has been appointed a director of Massey-Ferguson (Great Britain), Limited, in place of Mr. T. V. KNOX who has resigned.

Mr. R. D. PEARCE, B.SC. (HONS.), has been appointed a director of Keeton, Sons & Company, Limited, a member of the Firth Cleveland group.

Mr. JOHN F. WILLSHER, general works manager, George Kent, Limited, Luton, has been appointed to the board of directors of the company.

Mr. D. C. LORKIN has relinquished his position as managing director of Lancashire Dynamo & Crypto, Limited, and other directorships in the group.

Mr. HENRY CLAYTON has been elected to the board of Thomas Robinson & Son, Limited, woodworking, flour-milling and conveying engineers, Rochdale.

Mr. J. HOWLETT, general manager of the Hull site of the Distillers Company, Limited, has been appointed a division director of the chemical division of DCL.

Mr. R. R. TITFORD and Mr. A. S. COMPTON have been elected directors of Cope, Allman & Company, Limited, manufacturers of brass and copper tubes, Birmingham.

Mr. W. R. TIMKEN has been elected president of the Timken Roller Bearing Company, Limited, in succession to Mr. DWIGHT A. BESSMER who has resigned because of ill-health.

Mr. S. A. CLARKE, joint managing director of Gent & Company, Limited, horological and electrical engineers, Faraday Works, Leicester, has completed 50 years' service with the company.

Mr. LEONARD WALKER has been appointed general manager and Mr. H. E. ALAN NOBLE works manager of Noble & Lund, Limited, machine-tool manufacturers, Felling-on-Tyne, Co. Durham.

Sir OWEN JONES has been appointed a director of the Lilleshall Company, Limited. Mr. J. D. CRESSWELL and Mr. P. SIMMS have been appointed to the board of Fairmile Engineering Company, Limited, a subsidiary.

Mr. W. A. BEST and Mr. L. CUTHBERT have been appointed directors, and Mr. J. HOLMES (London sales manager) sales director, of Thomas Storey (Engineers), Limited, Vernon Works, Stockport, following the acquisition of the capital by Acrow, Limited.

Mr. M. C. PURBRICK, B.SC., has been appointed British Railways district engineer for Derby North. Formerly he was assistant district engineer at Manchester. He joined the Great Western Railway in 1946, before that he was with the Ministry of Aircraft Production.

Mr. HERBERT B. BRUCE has been appointed manager of the Clyde area of the South of Scotland Electricity Board in place of Mr. D. ROSS, who retired last month. Mr. Bruce was formerly engineer of Lanarkshire area of the Board, an appointment he has held since 1948.

Mr. LEONARD G. OXFORD, managing director of Simmonds Aerocessories, Limited, and Firth Cleveland Instruments, Limited, members of the Firth Cleveland group of companies, has been elected president of the South Wales branch of the National Union of Manufacturers.

Mr. NORMAN ELLYARD LANGDALE, education officer of Imperial Chemical Industries, Limited, has been seconded by ICI to perform the duties of director of practical training and placement at the College of Engineering and Technology, Delhi, for two years, under the Technical Co-operation Scheme of the Colombo Plan.

Mr. W. H. EVERARD has been appointed deputy general manager of the foundry division of Edgar Allen & Company, Limited, Sheffield, with Mr. J. M. T. LEVESLEY as his assistant. Earlier this year, Mr. Everard was appointed to the boards of the Edgar Allen subsidiaries, Park View Steel Works, Limited, Sheffield, and Aciéries d'Hirson, France.

Dr. CECIL DANNATT, a director of Associated Electrical Industries, Limited, and managing director of Associated Electrical Industries (Manchester), Limited, has been appointed vice-chairman of Associated Electrical Industries, Limited, with the special responsibility of co-ordinating both commercial and technical policy. He is succeeded at Manchester by Mr. H. WEST.

Mr. JOHN O. SEWELL has been appointed general manager of the British materials handling division and the British lock and hardware division of the Yale & Towne Manufacturing Company in succession to the late Mr. H. GILBERT RAMSELL. He also becomes managing director of E. Tonks & Sons, Limited, a Willenhall lock-making firm owned by Yale & Towne.

Sister M. WRIGHT, of the medical department of Samuel Osborn & Company, Limited, of Sheffield, who recently climbed 30 feet to the cabin of an overhead crane to give first aid to the crane driver, who had collapsed, and stayed with him until he was well enought to be lowered to the ground, has been presented with a bouquet of flowers on behalf of foundry personnel by Mr. F. A. Martin, a director.

The Sheffield industrialist, Sir STUART GOODWIN, has been given the Freedom of Retford in recognition of his services to the Borough. At the ceremony, he was presented with a silver casket specially made by James Dixon & Sons, Limited, of Cornish Place, Sheffield. Sir Stuart's latest gift is a cheque for £1,000 to be distributed among various organizations in Retford, Newark and Mansfield who care for the welfare of old people.

Director of sales for the International Harvester Company of Great Britain, Limited, since January, 1954, Mr. DAVID C. HANEY has been appointed assistant managing director. In the six years of his directorship, the company's sales volume has more than trebled, and in 1959 exceeded £23,500,000. At the same time, Mr. G. D. FRYMIRE has joined the board. He has been manager of domestic sales since 1957 and now becomes director of sales.

Mr. N. W. R. MAWLE, D.F.C., J.P., of Sutton Coldfield (vice-chairman and joint managing director of Smith-Corona, Limited), has succeeded Mr. K. Butler, of Derby, as national president of the Typewriter and Allied Trades' Federation. Mr. Mawle is already vice-president of the British Typwriter Manufacturers' Association. He is a past-president of the Office Appliance and Business Equipment Trades Association, past national chairman of the Incorporated Sales Managers' Association and former president of the Birmingham branch of ISMA.

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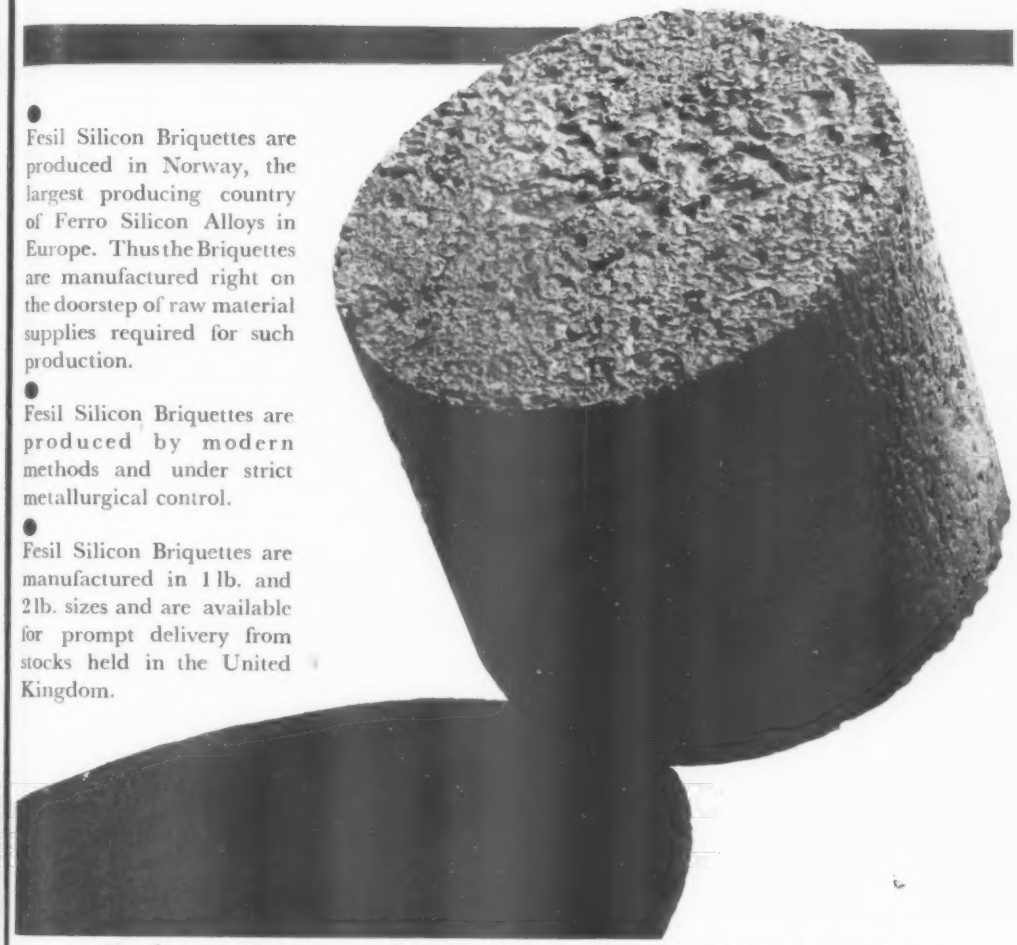

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MANUFACTURERS OF MANGANESE, SILICO-MANGANESE AND OTHER FERRO ALLOY BRIQUETTES

Raw Material Markets

Iron and Steel

Business at the ironfoundries is still concentrated largely on the production of high quality castings and, comparatively, there is a heavier demand for these than for other types. Most of the engineering and speciality foundries have, therefore, had a long run of good outputs and only those foundries catering principally for railways, collieries, and (until recently) the machine-tool trade, have received moderate demands for castings.

Foundries supplying castings for the machine-tool industry are now better employed, and demands are high from many other important industries, notably the motor industry. The call from this trade shows no signs of relaxing and the supplying foundries are producing at capacity. These foundries are using substantial tonnages of pig-iron in the low phosphorus grade, together with good quantities of hematite and some refined irons. Although supplies of some brands of low phosphorus irons and hematite are still limited, overall outputs enable the foundries to cover their needs for current and forward bookings.

The light casting trade is not working to capacity, but many foundries are reasonably well employed with the call for castings from the building trade and the continued steady demand from the domestic utensil industry. The jobbing and textile foundries can also get fairly good outputs of castings. The needs of these foundries for high phosphorus pig-iron are easily met and producing furnaces have spare tonnages, some of which continues to be shipped abroad.

The supply of scrap to the ironfoundries is satisfactory although a heavy demand persists for arisings of the better and heavier grades of cast-iron, steel, and machinery scrap. Foundry coke deliveries are also satisfactory and ganister, limestone, and firebricks are available on demand.

The market for all products of the re-rollers continues good, and although work on hand will keep them occupied for some time, orders continue to be received for quantities of small bars, light sections, reinforcing rods, and other finished material.

Their usage of steel semis is high and home steelworks are sending forward substantial quantities of steel billets, blooms, and slabs. Production at the re-rollers, however, is affected by lack of stocks and the difficulty in obtaining prompt deliveries, particularly in the 2-in. sq. size billets. All arisings at steelworks of suitable re-rolling defectives and crops are readily accepted.

Non-ferrous Metals

Copper in London continues firm and the immediate outlook is good. There are several factors influencing the market. In the short term there are three. First, there is the problem presented by the shortage of prompt metal. Stocks in official LME warehouses are at their lowest level for four years, a fact reflected by the backwardation which is still around £20 a ton. Secondly, there is the difficulty of relieving the shortage. Metal from America has arrived in this country in fairly large quantities. The price is right and so is the quality, but some of the shapes are not so scarce and are not finding much of a market. Moreover, all US exporters of copper must satisfy their own authorities that the copper they sell will not ultimately find its way to Communist countries. In many cases this undertaking cannot be given by the potential British buyer. Too, it is said that two out of the three American producers object to selling to the London Metal Exchange.

Thirdly there is the possibility that the threatened strike at Anaconda's two mines, El Salvador and Potrerillos in Chile, may spread to the whole of the Chilean copper industry. The position would appear to be that Anaconda has offered a wage increase of 35 per cent. and the unions are holding out for a rise of 60 per cent. No hint of a compromise is forthcoming. The unions, to win their point, are reported to be urging Chuquicamata and El Teniente to declare a supporting strike. The labour contract expires on May 1. If the Chilean industry goes on strike the copper market in London could soon be seriously short of the metal.

Looking a little further ahead, there is still the unsettled situation in South Africa, the fears that it may spread to the Rhodesian Copperbelt, and the unknown attitude of the Belgian Congolese Africans, who become masters of the country on June 30, next, towards the giant non-ferrous metal producer, Union Miniére de Haut Katanga.

In the US the market is only fair with production outrunning consumption. The price structure is unchanged with the producers and the custom smelters both quoting 33 cents a pound.

Tin continues quietly steady in London but dull in Singapore. Demand is focused on prompt metal of which there is not all that much about and prices are sensitive in the absence of the buffer stock manager. The US market is seemingly featureless. The US is buying more secondary tin than formerly, and now that prices are more stable is not buying forward very much; moreover, Indonesian ore, it is said, is increasingly going to the Texas smelter and there is not much need to supplement this supply with Straits metal.

If these developments continue, American consumers, it is said, "will cease to depend on imports of metal from Europe to supplement the shipments from the Straits, and the American price level may remain out of alignment for long periods with the London Metal Exchange and the European market." The US price is fluctuating narrowly around 99 cents a pound.

Lead continues a steady market in London and fair in the United States. In London demand is steady and the turnover is satisfactory. There are reports that for the first time for several months Spanish metal is being brought into the country, suggesting thereby that the usual sources of supply, Canada and Australia, are insufficient to meet present demand. In the US the price is unchanged at 12 cents a pound.

Zinc remains an active, basically strong market in London. The backwardation is tending to widen slightly and demand is making for a strong undertone. The US market is only fair and the price is still called 13 cents a pound for East St. Louis spot metal.

ICI Group Profits Expansion

Expansion of group manufacturing and trading profits of Imperial Chemical Industries, Limited, from £51,500,198 to £79,755,154 is announced. Company profits increased from £37,551,276 to £62,990,728. Group external sales were £508,500,000 compared with £462,700,000 and sales by the company to external customers and to subsidiaries, at home and overseas, advanced from £296,300,000 to £321,000,000.

Exports of ICI products from the UK rose by 19 per cent. to a record £87,500,000, and shipments to the Commonwealth increased by 10 per cent.

At the end of 1959 there were 341,757 holders of ICI stock. Of these, 309,791 were ordinary stockholders, an increase of 12,909 over the previous year.

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BP/F1

Current Prices of Iron, Steel, and Non-ferrous Metals

(Delivered unless otherwise stated)

April 27, 1960

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2, 10-ton lots or over: Middlesbrough, £21 6s. 0d.; Birmingham, £20 18s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.40 per cent. P, 10-ton lots or over, £23 5s. 0d., delivered Birmingham, £23 10s. 0d., delivered Grangemouth.

Cylinder and Refined Irons.—North Zone, £25 6s. 6d.; South Zone, £25 9s. 0d.

Refined Malleable.—P, 0.10 per cent. max.; North Zone, £26 6s. 6d.; South Zone, £26 9s. 0d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent., 10-ton lots or over: N.-E. of England (local iron), £23 19s. 0d.; Scotland (Scotch iron), Zone S.1, £24 5s. 6d.; Sheffield, £25 7s. 6d.; Birmingham, £25 14s. 0d.; Wales (Welsh iron), £23 19s. 0d.

Basic Pig-iron.—£20 3s. 0d., delivered Staffs, Derbyshire, Notts, Lincs, Rutland, Northants, and Leicestershire in 10-ton lots or over.

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered)

Ferro-silicon (6-ton lots and over).—45 per cent. Si, £41 10s. 0d. to £44 0s. 0d., scale 15s. 0d. per unit, lumpy; 75 per cent. Si, £57 0s. 0d. to £62 10s. 0d., scale 15s. 0d. per unit, lumpy.

Ferro-Vanadium.—50/60 per cent., 22s. 6d. per lb. of V.

Ferro-molybdenum.—65/70 per cent., carbon-free, 12s. 10d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., 2-3 per cent. Cu, £250 0s. 0d.; 38/40 per cent., commercially carbon-free, £287 0s. 0d.

Ferro-tungsten.—80/85 per cent., 11s. 8d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 14s. 8d. per lb. of W.

Ferro-chrome (6-ton lots and over, lumpy).—4/6 per cent. C, £78 10s. 0d. to £82 10s. 0d., basis 60 per cent. Cr. scale 26s. 0d. to 28s. 6d. per unit; over 6 per cent. C, £77 0s. 0d. to £80 10s. 0d., basis 60 per cent. Cr, scale, 26s. 0d. to 28s. 6d. per unit; 2 per cent. C,* 1s. 8d. to 1s. 11d. per lb. Cr; 1 per cent, C,* 1s. 8½d. to 1s. 11½d. per lb. Cr; 0.15 per cent. C,* 1s. 9½d. to 2s. 0½d. per lb. Cr; 0.10 per cent C,* 1s. 9¾d. to 2s. 0¾d. per lb. Cr; 0.06 per cent. C,* 1s. 10¼d. to 2s. 1d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 6s. 10d. per lb.

Metallic Manganese.—94/96 per cent., carbon-free, £275 0s. 0d.; 96/98 per cent., £285 0s. 0d.

Ferro-columbium.—65/67 per cent., Cb + Ta, 19s. 9d. per lb., Cb + Ta.

Ferro-manganese (Standard).—78 per cent., £63 10s. 0d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft u.t., 100 tons & over, £31 15s. 6d.; tested, 0.08 to 0.33 per cent. C, 6 to 35 tons, £33 15s. 6d.; hard (0.41 to 0.60 per cent. C), under 10 tons, £34 17s. 0d.; silico-manganese, under 10 tons, £43 16s. 6d.; free-cutting, under 10 tons, £36 14s. 6d. SIEMENS MARTIN ACID (under 10 tons): Up to 0.25 per cent. C, £41 1s. 0d.; silico-manganese, £44 4s. 0d.

Billets, Blooms, and Slabs for Forging and for Stamping (under 10 tons).—Basic, soft, up to 0.33 per cent. C, £38 10s. 0d.; basic, hard, over 0.41 up to 0.60 per cent. C, £39 12s. 6d.; acid, up to 0.25 per cent. C, £43 4s. 0d.

* Average 68-70 per cent.

FINISHED STEEL

Heavy Plates and Sections (1 ton to 10 tons).—Ship plates (N.-E. Coast), £41 12s. 0d.; boiler plates (N.-E. Coast), £44 2s. 0d.; floor plates (N.-E. Coast), £43 10s. 0d.; angles (N.-E. Coast), £38 16s. 6d.; joists (N.-E. Coast), £38 12s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., and flats 5 in. wide and under, untested soft basic, 50 tons and over, £39 1s. 0d.; under 10 tons to 4 tons, £40 18s. 0d.; under 4 tons to 2 tons, £41 3s. 0d.; hoop and strip, coils, 100 tons and over, £38 0s. 0d.; uncoated strip mill coils, hot rolled, under 3 mm. to 12g., 25 tons to under 50 tons, £43 16s. 0d.; black sheets (hand mill), 24g., 10 tons and over, £57 14s. 6d.; galvanized corrugated sheets, 24g., 10 tons and over, £68 5s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £67 17s. 0d.; nickel-chrome, £98 11s. 0d.; nickel-chrome-molybdenum £111 4s. 0d., in lots of 5 tons to under 10 tons.

NON-FERROUS METALS

Copper.—Cash, £265 10s. 0d. to £266 10s. 0d.; three months, £249 0s. 0d. to £249 10s. 0d.; settlement, £266 10s. 0d.

Copper, Tubes, etc.—Solid-drawn tubes, 2s. 7d. per lb.; rods, 284s. 6d. per cwt. basis; 20 s.w.g., 319s. 6d. per cwt.

Tin.—Cash, £797 0s. 0d. to £798 0s. 0d.; three months, £785 0s. 0d. to £785 10s. 0d.; settlement, £798 0s. 0d.

Lead (Refined Pig).—Second half April, £77 12s. 6d. to £77 17s. 6d.; second half July, £76 10s. 0d. to £76 12s. 6d.

Zinc.—Second half April, £93 5s. 0d. to £93 15s. 0d.; second half July, £90 5s. 0d. to £90 10s. 0d.

Zinc Sheets, etc.—Sheets, 15g. and thicker, all English destinations, £127 17s. 6d.; rolled zinc (boiler plates), all English destinations, £125 12s. 6d.; zinc oxide (Red Seal), d/d buyers' premises, £105 0s. 0d.

Brass Tubes, etc.—Solid-drawn tubes, 2s. 1½d. per lb.; sheets to 10 w.g., 230s. 6d. per cwt.; wire, 2s. 11d.; rolled metal, 230s. 6d. per cwt.

Brass (Brazing).—BS1400, B3, £176; B6, £230.

Brass (High Tensile).—BS1400, HTB1, £207; HTB2, £227; HTB3, £240.

Gunmetal.—BS1400, LG2, £222; LG3, £226; G1, 1% £290; G1, 1%, £278.

Phosphor Bronze.—BS1400, PB1 (AID released), £323; BS1400, 90/10/1, £299.

Leaded Phosphor Bronze.—BS1400, LPB1, £243.

Phosphor Bronze Strip, etc.—Strip, 325s. 0d. per cwt.; wire, 4s. 4¾d. per lb.; rods, 3s. 7½d.; tubes, 3s. 7½d.; chill cast bars, solids 3s. 7d.; cored 3s. 8d. (CHARLES CLIFFORD, LIMITED).

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide x 0.056, 4s. 1½d. per lb.; round wire, 10g. in coils (10 per cent.), 4s. 6½d.; special quality turning rod, 10 per cent. ½ in. dia., in straight lengths, 4s. 5½d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 2½d. to 2s. 3d. per lb. Antimony, English, 99 per cent., £190 0s. 0d. Quicksilver, ex-warehouse, £70 10s. 0d. to £71 0s. 0d. Nickel, £600 0s. 0d. Aluminium, ingots, £186 0s. 0d.; aluminium bronze (BS1400) AB1, £264; AB2, £274.

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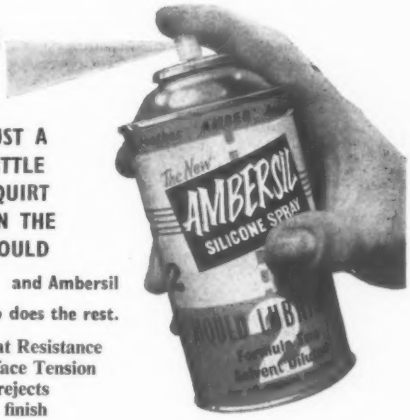

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SITUATIONS WANTED

FOUNDRY FOREMAN, 45, seeks similar position in gravity and pressure diecasting. Twenty-five years' experience. Anything considered. Box FO577, FOUNDRY TRADE JOURNAL.

41 YEAR old FOUNDRY FOREMAN, used to high quality high-duty iron castings up to 15 tons. Fully comprehensive foundry experience. C. & G., A.M.I.B.F. Box FY600, FOUNDRY TRADE JOURNAL.

FOUNDRY MANAGER, non-ferrous (49), seeks position of trust in foundry organisation, not necessarily as foundry manager. Similar organisation considered. Box FM597, FOUNDRY TRADE JOURNAL.

FOUNDRY MANAGER, iron and non-ferrous, 30 years' experience, 12 years' managerial, would take position as Castings Buyer. Results guaranteed. Box FO598, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT

WORKS METALLURGIST required for black and white heart malleable iron foundry in West Midlands. Good salary and excellent prospects for successful applicant. Box WM595, FOUNDRY TRADE JOURNAL.

WORKS MANAGER, with knowledge of Metallurgy and General Foundry Practice required for Grey Iron Foundry in Northamptonshire. Must be prepared to negotiate with customers. Salary by negotiation. Applications in writing to Box WM584, FOUNDRY TRADE JOURNAL.

EXPERIENCED ESTIMATOR required for a Midland Ironfoundry. Applicants should have had experience in weight estimation and estimation of production costs. Please write giving full details of experience, age and salary required to Box ES575, FOUNDRY TRADE JOURNAL.

SKILLED MOULDERS wanted by light castings ironfoundry in Country District East Anglia. Assistance with housing. Box SM576. FOUNDRY TRADE JOURNAL.

SKILLED MOULDER required for high quality iron castings. Interesting and varied work calling for a high degree of skill. Permanent position with sound prospects. KELL AND COMPANY, LTD., Barton Foundry, Gloucester.

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SENIOR DRAUGHTSMAN required with experience of Gravity and Pressure Dies or Moulds. Only competent men, able to command high salary, need apply. Works situated within 20 miles of North London. Apply Box SD580, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT—*contd.*

PLANT ENGINEER (40), A.M.I.Plant.E., A.M.I.B.F., seeks new position. Comprehensive experience installation, development, maintenance mechanised foundries, machine shops, process plant, etc. Salary envisaged £1,500—£1,800 plus housing. Box PE592, FOUNDRY TRADE JOURNAL.

ASSISTANT FOUNDRY MANAGER

REQUIRED for West Wales Engineering Works Steel and Non-ferrous Jobbing Foundries. The successful applicant should have first class technical and practical experience of jobbing production, have rate fixing experience and be a first class disciplinarian. The present Foundry Manager will be retiring very shortly and promotion will be prompt for the successful applicant.

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Full details of past experience, etc., to Box AF578, FOUNDRY TRADE JOURNAL.

SOUTH WALES Ironfoundry have a vacancy for a FOUNDRY TECHNICIAN; to be responsible for metallurgical and sand control and to assist manager with scrap investigations and new developments. Good salary and prospects for man able to improve quality. Contributory Pension Scheme. Particulars to Box SW593, FOUNDRY TRADE JOURNAL.

FOUNDRY FOREMAN required for non-ferrous Production Foundry, four Power Machines. Young practical man, able to take full charge immediately or after two years service. Full history, salary required. Box FF599, FOUNDRY TRADE JOURNAL.

SOUTHERN AGENTS of Midland and Northern Foundries producing grey iron, steel, malleable castings, require full-time experienced REPRESENTATIVE London area. Detailed application stating age, experience, salary required. Box SA596, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT—*contd.*

FOUNDRY FOREMAN required, must be fully experienced Moulder in Grey Iron Castings. Able to train labour in general jobbing and semi-mechanical plant. Only fully experienced men, not afraid of hard work, and able to take complete charge, need apply. The position offers considerable scope and advancement to Foundry Manager. Box FF594, FOUNDRY TRADE JOURNAL.

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FOREMAN REQUIRED for non-ferrous foundry in North-West London. Reply in writing to Box FR564, FOUNDRY TRADE JOURNAL.

FOUNDRY FOREMAN required for Non-ferrous Jobbing Foundry. Must be practical man and have held similar position. State full history and salary required. Box FO557, FOUNDRY TRADE JOURNAL.

PERSON wanted, with contacts, to take over Shell-moulding equipment now working. Partnership basis. WHITECROSS FOUNDRY, Whitecross Street, Brighton.

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SITUATIONS VACANT—*contd.*

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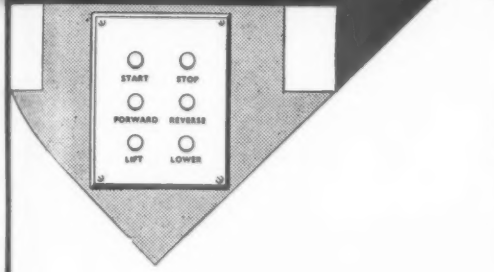

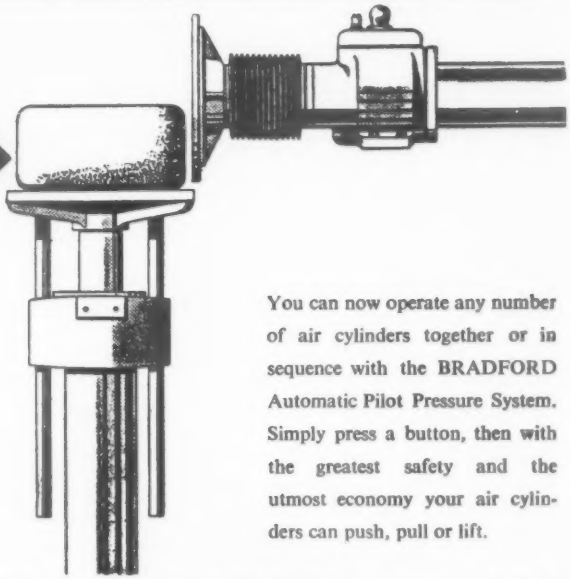

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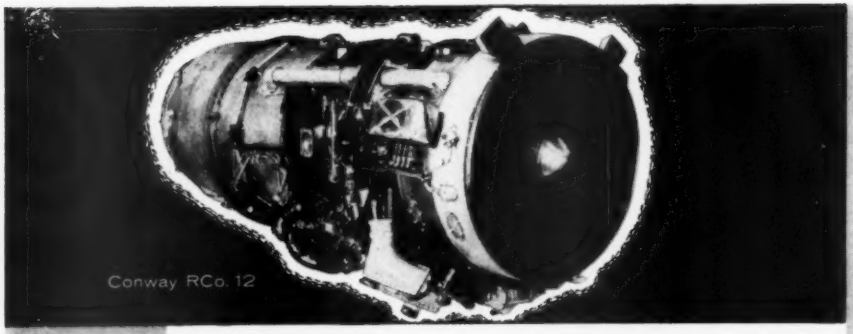

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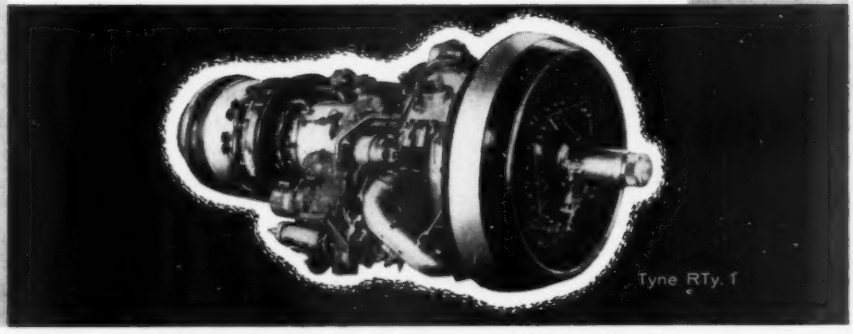

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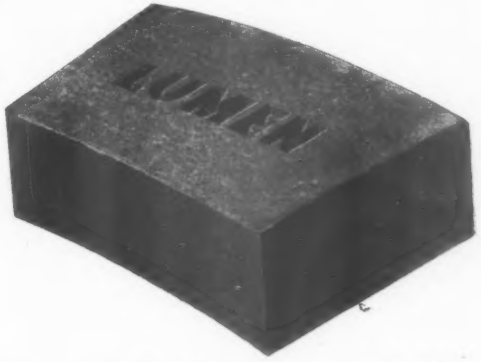

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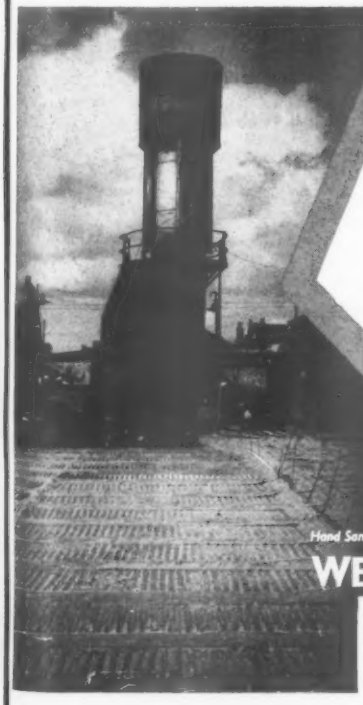

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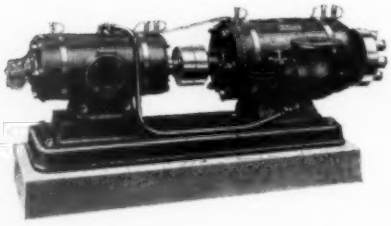

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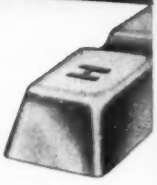

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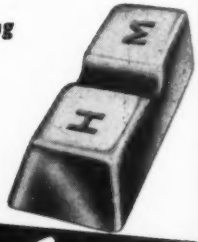

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INDEX TO ADVERTISERS

	PAGE NOS.
Ace Heaters (Hy-Lo), Ltd.	—
Air Control Installations Ld.	—
Albion Diemakers, Ltd.	47
Alcan (U.K.), Ltd.	—
Allan, John, & Co. (Glenpark), Ltd.	—
Allen, W. G., & Sons (Tipton), Ltd.	32
Alley & MacLellan (Polmadie), Ltd.	—
Amber Oils, Ltd.	41
Anderson-Grice Co., Ltd.	—
Annealers, Ltd.	55
Armstrong Whitworth (M.I.), Ltd.	16
Armstrong Whitworth & Co. (Pneu. Tools), Ltd.	—
Ashworth Ross Co., Ltd.	—
Aske, Wm., & Co., Ltd.	21
Associated Electrical Industires, Ltd. (Motor & Control Gear Division)	—
Ass. Lead Mfrs., Ltd.	52
Association of Light Alloy Refiners, Ltd.	—
Atlas Copco (G.B.) Ltd.	—
August's, Ltd.	40
Austin, E., & Sons, Ltd.	—
Badische Maschinenfabrik A.-G.	—
Bairds & Scottish Steel, Ltd.	38
Baker Perkins, Ltd.	541
Ballard, F. J., & Co., Ltd.	—
Ballinger, L. J. H., Ltd.	—
Beck, H., & Son, Ltd.	44
Belliss & Morcom, Ltd.	54
Bennett, H. G., & Co. (Gloves) Ltd.	—
Berk, F. W., & Co., Ltd.	1
Bilston Shot & Grit Co., Ltd.	—
Bilston Stove & Steel Truck Co., Ltd.	—
Birkett, F. W., & Co., Ltd.	—
Birlec-Efco (Melting), Ltd.	—
Birlec, Ltd.	—
B.I.X., Ltd.	—
Black & Decker, Ltd.	—
Blackwell's Metallurgical Works, Ltd.	—
Block & Anderson, Ltd.	—
Bloomer-Holt, Ltd.	—
Boydell, E., & Co., Ltd.	—
Bradbury, John, & Co. (Stockport), Ltd.	—
Bradley & Foster, Ltd.	8
British Acheson Electrodes, Ltd.	17
British Aero Components Ld.	—
British Electrical Repairs, Ltd.	—
British Foundry Units, Ltd.	—
British Industrial Sand Ltd.	—
British Iron & Steel Federation	—
British MonoRail, Ltd.	—
British Moulding Machine Co., Ltd.	—
British Oxygen Co., Ltd.	18
British Ronceray, Ltd.	—
British Shotblast & Engineering Co., Ltd.	52
Broadwell Engineering, Ltd.	—
Broom & Wade, Ltd.	—
Buckland Sand & Silica Co., Ltd.	—
Burn, John, & Co. (B'ham), Ltd.	—
Busby Bros., Ltd.	—
Carborundum Co., Ltd.	—
Catalin, Ltd.	—
Cawood Wharton & Co., Ltd.	52
Chetham Timber Co., Ltd.	46
Ciba (A.R.L.), Ltd.	22
City Casting & Metal Co., Ltd.	—
Clayton Crane & Hoist Co. Ld.	—
Cohen, Geo., Sons & Co., Ltd.	—
Coleman-Wallwork Co., Ltd.	11
Combustion Chemicals, Ltd.	—
Consolidated Pneumatic Tool Co., Ltd.	—
Constructional Engineering Co., Ltd., The	—
Controlled Heat & Air, Ltd.	—
Cooke, Bailey, Ltd.	45
Cox & Danks, Ltd.	36
Crockett Lowe, Ltd.	—
Cumming, Wm., & Co., Ltd.	12 & 13
Cupodel, Ltd.	—
Dallow Lambert & Co., Ltd.	—
Derby & Co., Ltd.	—
Distillers Co., Ltd., The	—
Distington Engineering Co., Ltd.	14
Dowler, H. J., Engineers & Pattern Makers, Ltd.	46
Dowson & Mason, Ltd.	—
Dunford & Elliott, Ltd.	—
Durrans, James, & Sons, Ltd.	57
Dustraction, Ltd.	—
Dustuctor Co., Ltd.	—
Electrical Development Assoc.	—
Elliott, E., & Co., Ltd.	—
Engineering Services (Manchester), Ltd.	2
Escol Products, Ltd.	—
Evans, James, & Co., Ltd.	—
Evans, Stanley N., Ltd.	—
Evershed & Vignoles, Ltd.	—
Eyre Smelting Co., Ltd.	55
F. & M. Supplies, Ltd.	539
Felco Hoists, Ltd.	26
Fellows & Darby, Ltd.	—
Fischer, George, Ltd.	—
Fisher-Foundries, Ltd.	—
Fletcher Miller, Ltd.	—
Flextol Engineering Co., Ltd.	23
Fordath Engineering Co., Ltd.	9
Foundry Equipment, Ltd.	28 & 29
Foundry Mechanisations (Baillot), Ltd.	—
Foundry & Metallurgical Equipment Co., Ltd.	—
Foundry Plant & Machinery, Ltd.	—
Foundry Services, Ltd.	50
Foundry Suppliers, Ltd.	—
Foxboro-Yoxall, Ltd.	—
Franklin Furnaces, Ltd.	—
Fuel Efficiency & Power for Industry Exhibition	—
Fuel & Metallurgical Processes, Ltd.	—
Fullers' Earth Union, Ltd., The	35
G.W.B. Furnaces, Ltd.	—
Gadd, Thos.	—
Gas Council	58
General Refractories, Ltd.	—
Gilbert, G. & R., Ltd.	52
Gliksten, J., & Son, Ltd.	—
Goodyear Tyre & Rubber Co., Ltd.	—
Green, E., & Son, Ltd.	—
Green, Geo., & Co.	—
Gregory, J. G., & Sons, Ltd.	—
Griffiths, A. E. (Smethwick), Ltd.	—
Grinding Improvements, Ltd.	5
Guest, Keen Iron & Steel Co., Ltd.	—
Hanover Fair	—
Harborough Construction Co., Ltd.	15
Hargraves Bros. (Manchester), Ltd.	—
Harris & Pearson, Ltd.	51
Harvey & Longstaffe, Ltd.	—
Harvey, J. J. & Pressurecast, Ltd.	—
Hedin, Ltd.	—
Heneage Metals, Ltd.	54
Hepburn Conveyor Co., Ltd.	24
Heywood, S. H., & Co., Ltd.	—
High Speed Steel Alloys, Ltd.	—
Hills (West Bromwich), Ltd.	—
Holmes, W. C., & Co., Ltd.	—
Hooker, W. J., Ltd.	—
Hunt, F. L., Ltd.	—
I.C.I. (Billingham Division), Ltd.	—
I.C.I. (Plastics Division), Ltd.	—
Ilford, Ltd.	—
Impregnated Diamond Products, Ltd.	—
Incandescent Heat Co., Ltd.	34
Ingersoll-Rand Co., Ltd.	—
Jackman, J. W., & Co., Ltd.	—
Jacks, Wm., & Co., Ltd.	41
Joy-Sullivan, Ltd.	—
Keith-Blackman, Ltd.	—
King, Geo. W., Ltd.	—
Lafarge Aluminous Cement Co., Ltd.	—
Laidlaw, Drew & Co., Ltd.	—
Lazarus, Leopold, Ltd.	—
Leicester Lovell & Co., Ltd.	19
Levy, B., & Co. (Patterns), Ltd.	45
L.M.S. Products, Ltd.	51
Lones, Joseph Laboratories	44
Lord, E. S., Ltd.	55
Luke & Spencer, Ltd.	—
Macnab & Co., Ltd.	—
Major, Robinson & Co., Ltd.	—
Mansfield Standard Sand Co., Ltd.	36
Marco Conveyor & Engineering Co., Ltd.	—
Matthews & Yates, Ltd.	—
May, J. H., Ltd.	46
McKechnie Bros., Ltd.	—
Metalectric Furnaces, Ltd.	—
Metalline Cement Co., The	—
Metals & Equipment (Wolverhampton), Ltd.	—
Midgley & Son, Ltd.	—
Midland Monolithic Furnace Lining Co., Ltd.	55
Mine Safety Appliances, Ltd.	—
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Modern Furnaces & Stoves, Ltd.	25
Molineux Foundry Equipment, Ltd.	—
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Morgan Crucible Co., Ltd.	—
Morris, B. O., Ltd.	—
Morris, H., Ltd.	—
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Newton Collins, Ltd.	—
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Nicholl & Wood, Ltd.	—
Norris Equipment & Construction, Ltd.	—
Ormerod, R. E., Ltd.	47
Palmer Aero Products, Ltd.	—
Parish, J., & Co., Ltd.	—
Park & Paterson, Ltd.	49
Parkinson Cowan Industrial Products	—
Passe, J. F., & Co.	—
Paterson Hughes Engineering Co., Ltd.	—
Patternecrafts, Ltd.	—
Pearson, E. J. & J., Ltd.	—
Peco Machinery Sales, Ltd.	—
Perry, G., & Sons, Ltd.	46
Phillips, J. W. & C. J., Ltd.	—
Pichard, W., & Co., Ltd.	—
Pickford, Holland, Ltd.	—
Platt Metals, Ltd.	—
Pneulec, Ltd.	7
Podmore, W., & Sons, Ltd.	—
Polford Engineering Co., Ltd.	—
Polygram Castings Co., Ltd.	20
Pontifex, H., & Sons, Ltd.	—
Prat-Daniels (Stroud), Ltd.	—
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Reavell & Co., Ltd.	—
Refined Iron Co. (Darwen), Ltd.	—
Reid, Wm., & Co.	—
Richards Structural Steel Co., Ltd.	—
Richardson Eng'g., Ltd.	33
Richardsons, R. J. & Sons Ltd.	—
Ridsdale & Co., Ltd.	—
Riley (I.C.) Products, Ltd.	—
Robson Refractories, Ltd.	—
Roper, E. A., & Co., Ltd.	6
Rowland, F. E., & Co., Ltd.	—
Rownson (Conveyors). Ltd.	—
Rubery Owen & Co., Ltd.	—
Rule & Moffat	—
Rustless Iron Co., Ltd.	—
Salter, Geo. & Co., Ltd.	33
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Spermolin, Ltd.	3
Stansby, W., & Co., Ltd.	—
Stanton Ironworks Co., Ltd. The	—
Staveley Iron & Chemical Co., Ltd.	—
Steels Engineering Installations	—
Stein, John G., & Co., Ltd.	31
Sterling Foundry Specialties, Ltd.	27
Sternol, Ltd.	—
Stott, S. S., Ltd.	—
Suffolk Iron Foundry (1920), Ltd.	—
Swynnerton Red Moulding Sand	—
Tallis, E., & Sons, Ltd.	48
Tangyes, Ltd.	—
Taylor Patterns, Ltd.	—
Temple Instruments, Ltd.	—
Thomas, G. & R., Ltd.	—
Thompson, John, Instrument Co., Ltd.	—
Thorp, J. & Son Ltd.	—
Tilghman's, Ltd.	10
Union Carbide, Ltd.	—
Unit Engineering Co.	—
United States Metallic Packing Co., Ltd.	47
Universal Pattern & Precision Engineering Co., Ltd.	—
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Waring Bros.	—
Warner & Co., Ltd.	30
Warrington Red Sand	—
Watsons (Metallurgists) Ltd.	—
Webster & Co. (Sheffield) Ltd.	—
West Midland Refining Co., Ltd.	53
Wigley Aluminium, Ltd.	4
Wilkinson Rubber-Linatex Co., Ltd.	—
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Wright & Platt, Ltd.	47

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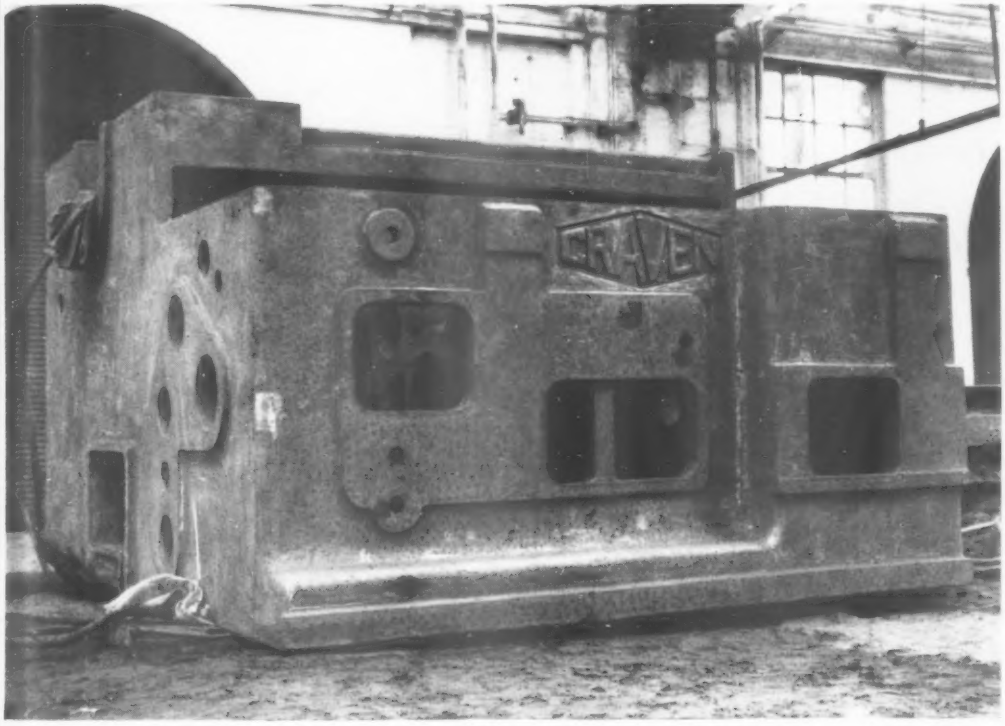

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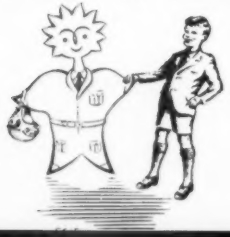

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